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(72)Inventor : KIKUCHI SHINJI  
MATSUSHIMA HIROHIKO

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## (54) DATA BASE FOR INTEGRATED MANAGEMENT OF PRODUCT DATA AND DEVELOPMENT MANAGEMENT FRAMEWORK

### (57)Abstract:

PURPOSE: To ensure the integrated management of various types of design data and production data which are generated in the development processes of products and also to perform the progress management of the development processes and the estimation of the development manhour.

CONSTITUTION: When the development entry is accepted by an entry acceptance function 1, the product names and the progress management data are registered in a product data integrated management data base 14. Then various tools are started by a tool operation control manager function 3 and a development job is carried on. When this job ends, the design and production data are registered in the base 14. At the same time, the development progress states are also registered as data. It is possible to output the progress states of development processes by retrieving the base 14 with the product name used as a key. Then a development manhour estimation function 74 is started to estimate the development manhour of the product under development or to be developed based on various data on the existing products.

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**CLAIMS**


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[Claim(s)]

[Claim 1] The process control table which decomposes all the business at the time of developing and manufacturing arbitrary products into a smallest unit, systematizes this business, adds the same recognition number, and manages a subordinate information by the product name and the same above-mentioned recognition number, The product process procedure master table containing the former data at the time of creating this process control table, CAD (Computer Aided Design) tool among the aforementioned process control tables, CAM (Computer Aided Manufacturing) tool, CAT (Computer Aided Testing) tool, CAE (Computer Aided Engineering) tool, And the process which receives tool support of CAPP (Computer Aided Process Planning) tool is extracted. The product data table which specifies the store place of the data which manage a subordinate information by the aforementioned product name and the same aforementioned recognition number, and the aforementioned CAD tool, the aforementioned CAM tool, the aforementioned CAT tool, the aforementioned CAE tool, and the aforementioned CAPP tool create, The aforementioned CAD tool, the aforementioned CAM tool, the aforementioned CAT tool, the aforementioned CAE tool, The distribution address table which has managed the subordinate information on the address of a system with reference to the case where the data which each tool of the aforementioned CAPP tool creates are distributed to the system besides a management of a development management framework, In the product data integration management database possessing the parts library table which carries out the unitary management of the parts used in case a product is developed The start time of WBS (Work Breakdown Structure) basic process registered into the aforementioned process control table about the product designed in the past, A finish time, accumulation working hours, a work man day, and the statistical-data table that manages the evaluation point of the process, The statistics master table which records the statistical information parameter drawn from the product designed in the past, The distribution management table which records the management matter about this distribution work, and the aforementioned CAD tool, The data which the arbitrary tool of the aforementioned CAM tool, the aforementioned CAT tool, the aforementioned CAE tool, and the aforementioned CAPP tool creates The product data integration management database characterized by providing the access-method table which manages the method which changes data into the format which suits this tool automatically when another arbitrary tool reads.

[Claim 2] The process control table which decomposes all the business at the time of developing and manufacturing arbitrary products into a smallest unit, systematizes this business, adds the same recognition number, and manages a subordinate information by the product name and the same above-mentioned recognition number, The product process procedure master table containing the former data at the time of creating this process control table, CAD tool among the aforementioned process control tables, CAM tool, CAT tool, The process which receives tool support of CAE tool and CAPP tool is extracted. The product data table which specifies the store place of the data which manage a subordinate information by the aforementioned product name and the same aforementioned recognition number, and the aforementioned CAD tool, the aforementioned CAM tool, the aforementioned CAT tool, the aforementioned CAE tool, and the aforementioned CAPP tool create, The aforementioned CAD tool, the aforementioned CAM tool, the aforementioned CAT tool, the aforementioned CAE tool, The distribution address table which has managed the subordinate information on the address of a system with reference to the case where the data which each tool of the aforementioned CAPP tool creates are distributed to the system besides a management of a development management framework, It is a product data integration management database possessing the parts library table which carries out the unitary management of the parts used in case a product is developed. The start time of WBS basic process registered into the aforementioned process control table about the product designed in the past, a finish time, accumulation working hours, a work man day, and the statistical-data table that manages the evaluation point of the process, The statistics master table which records the

statistical information parameter drawn from the product designed in the past, The distribution management table which records the management matter about this distribution work, and the aforementioned CAD tool, The data which the arbitrary tool of the aforementioned CAM tool, the aforementioned CAT tool, the aforementioned CAE tool, and the aforementioned CAPP tool creates The aforementioned CAD tool, the aforementioned CAM tool which were registered into the process control table which exists in the product data integration management database possessing the access-method table which manages the method which changes data into the format which suits this tool automatically when another arbitrary tool reads, Activation of the tool of the aforementioned CAT tool, the aforementioned CAE tool, and the aforementioned CAPP tool, Shutdown is controlled. And the aforementioned CAD tool, the aforementioned CAM tool, The data which the tool of the aforementioned CAT tool, the aforementioned CAE tool, and the aforementioned CAPP tool creates It stores in the field indicated in the aforementioned product data table in the aforementioned manufacture data integration management database. The tool motion-control manager ability which records the audit trail of the tool of the aforementioned CAD tool, the aforementioned CAM tool, the aforementioned CAT tool, the aforementioned CAE tool, and the aforementioned CAPP tool on a log file, The parts library management function to manage the aforementioned parts library table which the arbitrary tool of the aforementioned CAD tool, the aforementioned CAM tool, the aforementioned CAT tool, the aforementioned CAE tool, and the aforementioned CAPP tool refers to, In the development management framework which possesses design B / M creation function which creates a bill of materials from the data which the aforementioned CAD tool creates The entry receptionist function to register the instance of the aforementioned WBS basic process which describes the work breakdown which received the event of development start and was decomposed into the smallest unit as finite business in the aforementioned process control table, The data control function to perform a data maintenance of the aforementioned product data table automatically, The development schedule status-control function which displays development schedule progress of the aforementioned product registered by the aforementioned entry receptionist function from the aforementioned process control table and the aforementioned log file, The data distribution FM which transmits the aforementioned data which the arbitrary tool of the aforementioned CAD tool, the aforementioned CAM tool, the aforementioned CAT tool, the aforementioned CAE tool, and the aforementioned CAPP tool creates to an external system according to the applicable status, The aforementioned CAD tool, the aforementioned CAM tool, the aforementioned CAT tool, the aforementioned CAE tool, The method which changes them automatically so that the data format which this tool has may be suited when another tool reads the data which the arbitrary tool of the aforementioned CAPP tool creates, The aforementioned product data table, the aforementioned process control table, the aforementioned statistical-data table, the aforementioned statistics master table, The man day estimation function to presume the man day of the aforementioned product registered by the aforementioned entry receptionist function from the aforementioned access method and the aforementioned log file, The man day statistical information capture function to collect the man day statistical information of the product developed in the past from the aforementioned process control table, the aforementioned statistical-data table, and the aforementioned log file, The evaluation statistical information capture function to collect the evaluation point informations on the product developed in the past from the aforementioned product data table, the aforementioned statistical-data table, the aforementioned access-method table, and the aforementioned access method, The development management framework characterized by providing the statistical-analysis function to analyze the statistical information of the product developed in the past, and to register the analysis result into the aforementioned statistics master table from the aforementioned process control table and the aforementioned statistical-data table.

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[Translation done.]

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DETAILED DESCRIPTION

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## [Detailed Description of the Invention]

[0001]

[Field of the Invention] this invention relates to the product data integration management database and the Seki management framework which are applied to the business carried out in the technical section of the device industry which makes subassembly a subject among manufactures about a database and a framework especially, a design section, an IE section, a manufacturing department, and a management section about the technique of operating the data sequence or the content dealt with with a digital computer, and processing data.

[0002]

[Description of the Prior Art] The conventional technique is shown in drawing 10. Arbitrary products 101 When designing, an operator 123 is the design integrated framework function 102. It starts. Design integrated framework function 102 When it starts, it is the data storage field 103. Since it must specify, it is an operator 123. Product 101 Data file 109, 110, 111 Machine 104 to store A name and directory 105 It is the design integrated framework function 102 about a name. It inputs.

[0003] Design integrated framework function 102 Low-ranking CAD tool 106, 106a, the CAE tool 107, and CAT tool 108 Directory 105 into which the store place of the data files 109, 109a and 110, 111 to create was inputted It sets up. Then, CAD tool 106 which should be used for the beginning among CAD tool 106, 106a which exists partly It is used and is a product 101. It is designed. Consequently, CAD tool 106 Data file 109 created Inputted directory 105 It is created by the subordinate. CAD tool 106 which should be used first Data file 109a created by this CAD tool 106a when designing the following process by another CAD tool 106a, after completing a design is also a directory 105. It is stored.

[0004] Design [ after using CAD tool 106, 106a and ending a series of design procedure ] integrated framework function 102 By the CAM tool 112 which a subordinate does not have, it is the manufacture relation data file 113. It is a directory 105 when creating. Data file 109 which exists in a subordinate File transfer program 114, 114a is minded and it is the CAM tool 112. Own directory 115 It copies to a subordinate. Copy data file 109a is created as a result of a copy. Then, operator 123 The concerned copy data file 109a is minded, and it is the CAM tool 112. It processes.

[0005] CAM tool 112 In case it processes, it is the concerned CAM tool 112 about the format of data file 109a as pretreatment. It is an operator 123 in order to change into a peculiar format. Conversion program 116 It starts. This conversion program 116 It is the interval generation file 117 as a result of activation. It is created. Operator 123 Conversion program 116 Interval generation file 117 Concerned CAM tool 112 after creating It starts. CAM tool 112 When processing by another different CAM tool 112a, it is a conversion program 116. Another different conversion-program 116a must be prepared, and it must change into the format that CAM tool 112a corresponds.

[0006] It is the design integrated framework function 102. A subordinate's CAD tool 106 Data file 109 created It is an operator 123 when a version is updated. A conversion program 116 and interval generation file 117 It must be used and the same procedure must be performed again.

[0007] Moreover, CAM tool 112 Different tool 118 It is a data file 109. It is the CAD tool 106, without using it. It is the output space 119 about a result. You have to adopt the technique of reading using a digitizer 120 after a printing.

[0008] Design integrated framework function 102 Whenever it controls activation of a subordinate's CAD tool 106, 106a, and an operation of a halt, it is a log file 121. Record 122 It appends. The concerned file 121 From the content, an operation of each CAD tool 106, 106a can be checked. However, file 121 Product 101 It is not used as development schedule status-control data. Therefore, product 101 When carrying out a development schedule status control, it is the design integrated framework function 102. Operator 123 who

uses a subordinate's CAD tool 106,106a Self-assessment document 125 to fill in It will refer to and correspond. Moreover, product 101 A management of a man day, a forecast, and a cost forecasting are an operator 123. Self-assessment document 125 A hand calculation or the status-control system after EDP input will perform based on the obtained data.

[0009] Design integrated framework function 102 About data file 109,109a which a subordinate's CAD tool 106,106a created, it is another system 124. When distributing, file transfer program 114,114a is used. In this case, since the status of data file 109,109a and 110,111 [ themselves ] is not necessarily managed, the file transfer also of developing data becomes possible.

[0010] JP,4-336382,A is mentioned as well-known data near the conventional technique explained above.

[0011]

[Problem(s) to be Solved by the Invention] There are the following technical problems in the conventional technique explained above.

[0012] Sharing-izing the data contained [ 1st ] in data files 109,109a and 110,111 Design integrated framework function 102 A subordinate's CAD tool 106,106a, the CAE tool 107 and CAT tool 108 it can accept, come out and do -- \*\*\*\* -- not passing -- data file 113 of CAM tool 112,112a Since the technique of managing does not exist It must re-create one by one using conversion-program 116,116a, and is a data file 113. Since a whereabouts will be changed simply, it is this data file 113. It may lose.

[0013] To the 2nd, the status control of a development schedule and a forecast of a man day are an operator 123 with the conventional technique. Self-assessment document 125 to create Related data are collected, the hand calculation or the status-control system after EDP input is performing on the basis of it, by such technique, timely grasp of development progress and a forecast of a development cost cannot be performed, but the design change on account of a cost reduction becomes impossible.

[0014] To the 3rd, it is a product 101 with the conventional technique. Subordinate data control is an operator 123. It depends and it is not managed where data files 109,109a and 110,111,113 actually exist.

[0015]

[Means for Solving the Problem] The process control table which this invention decomposes all the business at the time of developing and manufacturing arbitrary products into a smallest unit, systematizes this business, adds the same recognition number, and manages a subordinate information by the product name and the same above-mentioned recognition number, The product process procedure master table containing the former data at the time of creating this process control table, CAD (Computer Aided Design) tool among the aforementioned process control tables, CAM (Computer Aided Manufacturing) tool, CAT (ComputerAided Testing) tool, CAE (Computer Aided Engineering) tool, And the process which receives tool support of CAPP (Computer Aided Process Planning) tool is extracted. The product data table which specifies the store place of the data which manage a subordinate information by the aforementioned product name and the same aforementioned recognition number, and the aforementioned CAD tool, the aforementioned CAM tool, the aforementioned CAT tool, the aforementioned CAE tool, and the aforementioned CAPP tool create, The aforementioned CAD tool, the aforementioned CAM tool, the aforementioned CAT tool, the aforementioned CAE tool, The distribution address table which has managed the subordinate information on the address of a system with reference to the case where the data which each tool of the aforementioned CAPP tool creates are distributed to the system besides a management of a development management framework, In the product data integration management database possessing the parts library table which carries out the unitary management of the parts used in case a product is developed The start time of WBS (Work Breakdown Structure) basic process registered into the aforementioned process control table about the product designed in the past, A finish time, accumulation working hours, a work man day, and the statistical-data table that manages the evaluation point of the process, The statistics master table which records the statistical information parameter drawn from the product designed in the past, The distribution management table which records the management matter about this distribution work, and the aforementioned CAD tool, The data which the arbitrary tool of the aforementioned CAM tool, the aforementioned CAT tool, the aforementioned CAE tool, and the aforementioned CAPP tool creates When another arbitrary tool reads, it is characterized by providing the access-method table which manages the method which changes data into the format which suits this tool automatically.

[0016] The process control table which this invention decomposes all the business at the time of developing and manufacturing arbitrary products into a smallest unit, systematizes this business, adds the same recognition number, and manages a subordinate information by the product name and the same above-mentioned recognition number, The product process procedure master table containing the former data at the time of creating this process control table, CAD tool among the aforementioned process control tables, CAM tool, CAT tool, The process which receives tool support of CAE tool and CAPP tool is extracted. The

product data table which specifies the store place of the data which manage a subordinate information by the aforementioned product name and the same aforementioned recognition number, and the aforementioned CAD tool, the aforementioned CAM tool, the aforementioned CAT tool, the aforementioned CAE tool, and the aforementioned CAPP tool create, The aforementioned CAD tool, the aforementioned CAM tool, the aforementioned CAT tool, the aforementioned CAE tool, The distribution address table which has managed the subordinate information on the address of a system with reference to the case where the data which each tool of the aforementioned CAPP tool creates are distributed to the system besides a management of a development management framework, It is a product data integration management database possessing the parts library table which carries out the unitary management of the parts used in case a product is developed. 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[0017]



[Example] Next, this invention is explained with reference to a drawing. Drawing 1 is a block diagram showing one example of this invention.

[0018] Drawing 2 shows the relation of the entry receptionist function in drawing 1, a product data integration management database, a data control function, and the tool motion-control manager ability to a method.

[0019] Drawing 3 shows the detail of the process control table in drawing 2, a product process procedure master table, a product data table, a distribution address table, a parts library table, the access-method table that the product data integration management database constituted including a log file holds, a distribution management table, a statistical-data table, a statistics master table, the above-mentioned process control table and the above-mentioned product process procedure master table, the above-mentioned product data table, the above-mentioned distribution address table, the above-mentioned parts library table, and the above-mentioned log file.

[0020] Drawing 4 shows the relation with design B / M creation function to the access-method table of the above-mentioned product data integration management database in drawing 1 and the above-mentioned process control table of the above-mentioned product data integration management database, and the above-mentioned product data table.

[0021] Drawing 5 shows the relation of the product data table of the above-mentioned product data integration management database to the data distribution FM in drawing 1, a distribution address table, and a distribution management table.

[0022] Drawing 6 shows the relation of the above-mentioned tool motion-control manager ability to the development schedule status-control function in drawing 1, the above-mentioned process control table of the above-mentioned product data integration management database, and the above-mentioned product process procedure master table.

[0023] Drawing 7 shows the relation of the parts library management function in the above-mentioned development management framework to the access-method table and method of the above-mentioned product data integration management database in drawing 1.

[0024] Drawing 8 shows the relation of the above-mentioned process control table of the above-mentioned product data integration management database, and the above-mentioned product process procedure master table to the man day statistical information capture function in drawing 1, an evaluation statistical information capture function, a statistical-analysis function, a man day estimation function, an entry receptionist function, the above-mentioned access-method table of the above-mentioned product data integration management database, a statistical-data table, and a statistics master table.

[0025] The representation technique of a parentage in a version-control method is shown in drawing 9.

[0026] Next, with reference to drawing 2, the relation of the above-mentioned entry receptionist function, the above-mentioned product data integration management database, the above-mentioned data control function, and the above-mentioned method and the above-mentioned tool motion-control manager ability is explained in detail.

[0027] The tool motion-control manager ability 3 performs the motion control of the tool of the CAD tool 4, the CAE tool 5, the CAM tool 6, the CAT tool 7, and the CAPP tool 8, and an environmental control, and adds the function of the above-mentioned method reading to what is called from the former EDA (Electric Design Automation) framework function.

[0028] In the entry receptionist function 1, it is the function to register the newly developed product and to register the development process of this product.

[0029] The product data integration management database 14 is what manages the data file 25 which each tool of the CAD tool 4, the CAM tool 6, the CAT tool 7, the CAE tool 5, and the CAPP tool 8 creates, and its access technique. The process control table 15 which develops a product, is what described the work breakdown at the time of manufacturing, is equivalent to an operating flow management table, and exists from the former, The product process procedure master table 16 which offers the former data of the process control table 15, The product data table 17 with the structure seen by the filing system in EDA framework, In the distribution address table 47 which has managed the correspondence relation between a network address and a system, and is equivalent to the conventional object dictionary, and CAD tool The parts library table 49 which exists from the former is included. in CAD tool The access-method table 22 of the new definition which the access technique of data is specified and manages the method which is also a data-conversion program while the log file 20 which exists from the former is included, The start time of WBS basic process registered into the distribution management table 48 and the process control table 15 of the new definition which manages distribution to an external system, It is constituted including the statistical-data table 50 of the new definition which manages a finish time, accumulation working hours, a work man



day, and the evaluation point of the process, and the statistics master table 51 of the new definition which records the statistical information parameter drawn from the product designed in the past.

[0030] The data control function 2 performs automatically a data maintenance of the product data table 17 in the product data integration management database 14.

[0031] If an activate request 35 is received through I/O device 13, in order that the entry receptionist function 1 may prepare a development of the product name specified by the activate request 35, it searches the process control table 15 in the product data integration management database 14, and confirms whether the instance 21 with the product name inputted by the entry receptionist function 1 exists.

[0032] About an instance 21, when the instance 21 does not exist, in order that the entry receptionist function 1 may register a product name and WBS unit process into the process control table 15 and only an applicable affair may register it at a search key, it becomes an operator's 11 input work waiting.

[0033] The standardization activities in the organization to which the above-mentioned WBS unit process is the work unit which constitutes development work of the above-mentioned product, and an operator 11 belongs define clearly. Usually, the above-mentioned WBS unit process of a 100 number - a 1000 number is registered into the process control table 15 per product.

[0034] This WBS unit process is registered into the product process procedure master table 16. When only WBS unit-process relevance affair registers an instance 21 into the process control table 15 by the entry receptionist function 1, an operator 11 selects all the instances 36 by which the list reference display is carried out from the product process procedure master table 16 on I/O device 13.

[0035] When not performing an arbitrary WBS unit process in the development process of the above-mentioned product, an operator 11 should just generate the abandonment event 29 on I/O device 13.

[0036] Then, if an operator 11 generates the input end event 30, an instance 21 will be registered into a key only for an applicable affair in the above-mentioned product name and the above-mentioned WBS unit process in the process control table 15.

[0037] A non-adopted flag is set to the process adoption flag of the corresponding instance 21 in case the above-mentioned arbitrary WBS unit process which especially the abandonment event 29 generated is registered into the process control table 15. An operator 11 can register the instance 21 of the process control table 15 easily by the above-mentioned technique.

[0038] WBS unit process which will receive tool support if the entry receptionist function 1 registers the instance 21 of the quantity corresponding to the above-mentioned product and the above-mentioned WBS unit process into the process control table 15 is extracted, and the above-mentioned product name and the above-mentioned WBS unit process are packed into the product data table 17 in the above-mentioned product data integration management database, the process instance 18 of the applicable number of cases is packed into a key, and it registers.

[0039] Whenever the tool of the CAD tool 4, the CAE tool 5, the CAM tool 6, the CAT tool 7, and the CAPP tool 8 generates newly the data file 25 relevant to the above-mentioned product, the store machine and the origin directory 26 of this data file 25, and the status are written down in this process instance 18.

[0040] When it is going to start the tool of the CAD tool 4, the CAE tool 5, the CAM tool 6, the CAT tool 7, and the CAPP tool 8 for development start of an operator 11, the tool motion-control manager ability 3 starts as pretreatment. This tool motion-control manager ability 3 performs a starting control of each tool of a subordinate's CAD tool 4, the CAE tool 5, the CAM tool 6, the CAT tool 7, and the CAPP tool 8.

[0041] This tool motion-control manager ability 3 performs the input request of the above-mentioned product name which rises and was sometimes inputted by the entry receptionist function 1 at the operator 11.

[0042] If the product name value 37 inputted by the entry receptionist function 1 is inputted through I/O device 13, this tool motion-control manager ability 3 will search the process instance 18 of the product data table 17 to a key, and will carry out the list display of this product name value 37 at I/O device 13. An operator 11 selects the corresponding process instance 18 out of the above-mentioned list display.

[0043] When reference of this process instance 18 can be performed and the above-mentioned store machine which is the arrangement place of a data file 25, and the origin directory 26 are indicated, the data file 25 will already have existed. In this case, an operator 11 performs the input (the update displacement and either of the new editions are specified) of a version and the access technique specification 38 to this tool motion-control manager ability 3.

[0044] Although the process instance 18 exists as a result of this tool motion-control manager ability's 3 searching the product data table 17, when the above-mentioned store machine which is the arrangement place of a data file 25, and the origin directory 26 are not indicated, the above-mentioned WBS unit process which still corresponds will not be worked.

[0045] In this case, an operator 11 inputs the store machine by which the data file 25 which is the store place of the data which each tool of the CAD tool 4, the CAE tool 5, the CAM tool 6, the CAT tool 7, and the CAPP tool 8 generates belongs, and the identifier data 39 of the origin directory 26 to this tool motion-control manager ability 3 through I/O device 13.

[0046] This tool motion-control manager ability 3 overwrites the store machine and the origin directory 26 which were inputted at the selected process instance 18.

[0047] When especially the CAD tool 4 is unified and it is considering as the EDA framework 9, this origin directory 26 of the data file 25 in which this EDA framework 9 carries out a batch management is indicated.

[0048] Then, since a data file 25 will be generated by this store machine and the origin directory 26, this tool motion-control manager ability 3 hangs a read&write lock on the selected process instance 18, and prevents from using it for it from other tools to them.

[0049] Then, the tool motion-control manager ability 3 creates the key file 19 which described the above-mentioned product name inputted by the entry receptionist function 1 to the above-mentioned store machine and origin directory 26 subordinate.

[0050] then, a subordinate's CAD tool 4 with which self has managed this tool motion-control manager ability 3 from the process instance 18 chosen by the operator 11, the CAE tool 5, the CAM tool 6, the CAT tool 7, or the CAPP tool 8 -- in order to start a tool, the activation event 42 is published

[0051] Whenever the tool motion-control manager ability 3 starts the tool of a subordinate's CAD tool 4, the CAE tool 5, the CAM tool 6, the CAT tool 7, and the CAPP tool 8, it generates the log record 24, and it appends it to the file 20 of the decided machine.

[0052] A status ID item (start, an interruption, end), a tool ID item, an event time item, a product name item, and a login-name item are written in a file 20.

[0053] The data file 25 created by the tool of the CAD tool 4 started by the tool motion-control manager ability 3, the CAE tool 5, the CAM tool 6, the CAT tool 7, and the CAPP tool 8 is created by the above-mentioned store machine and temporary file 27 with the another origin directory 26.

[0054] However, in the process instance 18 to which the product data table 17 corresponds, it is the above-mentioned read&write. Since it is locked, a data file 25 cannot be used from the tool of the CAD tool 4 different from the above-mentioned tool in tool motion-control manager ability 3 subordinate's activation condition, the CAE tool 5, the CAM tool 6, the CAT tool 7, and the CAPP tool 8.

[0055] The field where a temporary file 27 is stored is described at the key file 19.

[0056] \*\* [ an end of processing with the CAD tool 4, the CAE tool 5, the CAM tool 6, the CAT tool 7, and the CAPP tool 8 / move / the data file 25 created with the CAD tool 4, the CAE tool 5, the CAM tool 6, the CAT tool 7, and the CAPP tool 8 / the tool motion-control manager ability 3 / from the store field of the temporary file 27 currently described at the key file 19 / to the above-mentioned store machine indicated by the process instance 18 and

[0057] The tool motion-control manager ability 3 obtains the proper global name 23 which should have the data file 25 which the CAD tool 4, the CAE tool 5, the CAM tool 6, the CAT tool 7, and the CAPP tool 8 create from the access-method table 22 in the case of this move treatment.

[0058] Then, the tool motion-control manager ability 3 renames a data file 25 by the above-mentioned proper global name (23) and the version extension.

[0059] In case the tool motion-control manager ability 3 is started as above-mentioned, when the above-mentioned store machine which stores a data file 25 in the process instance 18, and the origin directory 26 are indicated, an operator 11 performs version specification and the input of the access technique to this tool motion-control manager ability 3. The value of the above-mentioned version extension is decided according to this \*\*\*\*\* and this access technique.

[0060] Then, the tool motion-control manager ability 3 releases the above-mentioned read&write lock of the process instance 18 with which the product data table 17 corresponds, and changes it into the status more nearly accessible than other tools. Then, the pathname of the temporary file 27 indicated by the key file 19 is deleted.

[0061] A data file 25 is indicated in the format included in the key file 19 to the above-mentioned version extension as described in drawing 9 . The greatest thing of this version extension is a latest edition, and when referred to using a method 31, the thing of this latest edition serves as an object.

[0062] After that, the tool motion-control manager ability 3 generates the log record 24, and appends it to the file 20 of the decided above-mentioned machine.

[0063] The data control function 2 starts on the machine by which the product data integration management database is mounted at the fixed spacing.

[0064] If the data control function 2 starts, the data control function 2 will retrieve the product data table 17

sequentially, and will obtain the pathname of the above-mentioned store machine indicated by the process instance 18 and the origin directory 26.

[0065] Then, the data control function 2 checks presence of a key file 19 from the above-mentioned store machine and the origin directory 26.

[0066] When the data file 25 created with the CAD tool 4, the CAE tool 5, the CAM tool 6, the CAT tool 7, and the CAPP tool 8 moves to the above-mentioned store machine, store machine with the another origin directory 26, and the origin directory 28 and serves as data file 25a by the constraint on disk capacity, and product end, the data control function 2 carries out read lock of the applicable process instance 18 of the product data table 17.

[0067] Then, this data control function 2 publishes the activation event 40 which starts the task 10 which searches for a key file 19.

[0068] When the started task 10 discovers the above-mentioned store machine by which a key file 19 belongs, and the origin directory 28, a task 10 hands over the information 43 on the above-mentioned store machine and the origin directory 28 to the data control function 2, and ends processing.

[0069] The data control function 2 indicates the pathname of this store machine and the origin directory 28 to the process instance 18 of the product data table 17. Then, the above-mentioned read lock is canceled.

[0070] After starting the CAD tool 4, when an operator 11 refers to the data file 25 which the CAD tool 4 created with the CAT tool 7 here, the tool motion-control manager ability 3 which has managed the CAT tool 7 searches the access-method table 22.

[0071] Then, tool motion-control manager 3 function searches a method 31 for tool ID (ID of the CAD tool 4) of a tool to link, and tool ID (ID of this CAT tool 7) of the tool of the subordinate who has managed self from the access-method table 22 to a key, and acquires the method information 44. When two or more applicable instances 45 of a method 31 exist, instance ID is also specified further and a method 31 is specified as the access-method table 22.

[0072] Then, the tool motion-control manager ability 3 draws the above-mentioned store machine and the origin directory 26 from the process instance 18 corresponding to the above-mentioned tool (this CAD tool 4) of the product data table 17. Then, the tool motion-control manager ability 3 performs the method call 41 of the method 31 to which the above-mentioned drew the above-mentioned store machine and the origin directory 26 to the argument.

[0073] From the method registration directory 32, then, the above-mentioned mortgage \*\*\*\*s method 31 It is developed on the memory 12 on the machine by which the data file 25 was stored. The data indicated by the data file 25 of the latest version of the above-mentioned tool (this CAD tool 4) of choice It is changed by the method 31, and it becomes the data 33 of the CAT tool 7, is developed on memory 12, and is transmitted to the machine which has started the tool motion-control manager ability 3 after that.

[0074] The fraction depending on the data file 25 of a tool (tool 4) besides [ which was referred to in order to create data 33 ] the above-mentioned is not indicated by the data file 34 of the CAT data 33 newly created. On work, when these data 33 are needed, the tool motion-control manager ability 3 develops data 33 on memory 12 through a method 31 to whenever [ the ].

[0075] The tool motion-control manager ability 3 is measuring the number of tasks on the partner machine by which the data file 25 of the above-mentioned tool wishing a link is stored just before reading the access-method table 22, and the amount of traffic of the network which connects the machine by which tool motion-control manager ability 3 is mounted.

[0076] When it is late to develop data 33 on memory 12 through a method 31, in case the tool motion-control manager ability 3 performs a method 31, it has a performance top problem, the data file 25 applicable to the disk and memory of the machine by which tool motion-control manager ability 3 is mounted is copied, and data 33 are obtained after changing by the method 31.

[0077] These data 33 can also be changed into the status that it does not volatilize. However, these data 33 are usually deleted at the time of an end of the tool motion-control manager ability 3.

[0078] As for the process instance 18 of the product data table 17, a read&write lock takes as mentioned above in that case.

[0079] If drawing 4 is referred to, design B / M creation function 89 will output designs B/M on the basis of the result of PWB design. That is, in case the above-mentioned designs B/M are created, CAD data file which PWB design completed is needed. Activation of design B / M creation function 89 creates the above-mentioned designs B/M according to the following procedure. First, on the basis of product name ID54 inputted from I/O device 13, from the process control table 15 ( drawing 3 ), design B / M creation function 89 obtains WBS unit-process ID55 showing PWB design process, and displays the list of the WBS unit processes 55 on I/O device 13. An operator 11 chooses from this list WBS unit process which created the

CAD data file 90 used as the former data of designs B/M91 (WBS unit-process ID55 is determined).

[0080] Next, design B / M creation function 89 searches the process instance 18 which satisfies the conditions shown below to the product data table 17, and obtains the whereabouts (package machine ID57, origin directory 58) of the CAD data file 90, and used tool ID56 at the time of the CAD data file 90 creation. The aforementioned conditions are in agreement with what WBS unit-process ID55 of the product data table 17 chose from WBS unit-process list in accordance with that into which product name ID54 of the product data table 17 was inputted from I/O device 13. Furthermore, design B / M creation function 89 searches what fulfills the following conditions 1 - the conditions 3 altogether to the access-method table 22, and obtains the method 31 which should be used for data conversion. That the aforementioned conditions 1 are what the "partition 93" of the access-method table 22 expresses PWB design to, and the aforementioned conditions 2 are that "used tool ID95" of the access-method table 22 is the thing and match which were obtained from the product data table 17 in that "self-tool ID94" of the access-method table 22 is what is the output tool of designs B/M91, and the aforementioned conditions 3. Design B / M creation function 89 reads the CAD data file 90, uses a method 31, extracts items (parts ID, a parts name, circuit notation, etc.) required for design B / M91 creation, after that, from the item, it uses parts ID of the CAD data file 90 as a key, performs exclusion of false parts, or an addition of parts attributes (parts unit price etc.) with reference to the parts library table 49, and creates designs B/M91.

[0081] If drawing 5 is referred to, data distribution FM 52 will transmit manufacture data 60a created by the tool motion-control manager ability 3 using the CAD tool 4 which is having motion control performed, the CAE tool 5, the CAM tool 6, the CAT tool 7, and the CAPP tool 8 to the external system 53. This manufacture data 60a must be effective at the newest. Activation of data distribution FM 52 performs distribution of manufacture data 60a in the other systems 53 according to the following procedure. First, on the basis of product name ID54 inputted from I/O device 13, and WBS unit-process ID55, data distribution FM 52 searches the process instance 18 from the product data table 17, obtains the whereabouts (package machine ID57, origin directory 58) of effective manufacture data 60a, and creates the transfer file 59 by data copy. Next, on the basis of the system name 61 of the destination inputted from I/O device 13, data distribution FM 52 acquires the TCP/IP address 62 of this system from the distribution address table 47, and transmits the transfer file 59 to an alien system 53 (it becomes a data file 60).

[0082] Furthermore, data distribution FM 52 obtains 63 versions of manufacture data 60a transmitted last time from the distribution management table 48 on the basis of product name ID54 of \*\*, WBS unit-process ID55, and the system name 61, raises the 1 edition of 63 versions, and registers it.

[0083] Moreover, abandonment of manufacture data 60a is performed according to the following procedure. Data distribution FM 52 extracts altogether the system name 61 which transmitted manufacture data 60a from the distribution management table 48 on the basis of product name ID54 and WBS unit-process ID55 which were inputted from I/O device 13. Next, data distribution FM 52 acquires the TCP/IP address 62 of this system from the distribution address table 47 on the basis of a system name 61, and notifies abandonment of manufacture data 60a. Simultaneously, data distribution FM 52 considers the status 65 of the distribution management table 48 over a system name 61 as "abandonment", and registers it.

[0084] If drawing 6 is referred to, the development schedule status-control function 66 can grasp easily the progress statuses, such as design work performed by the tool motion-control manager ability 3 using the CAD tool 4 which is having motion control performed, the CAE tool 5, the CAM tool 6, the CAT tool 7, and the CAPP tool 8.

[0085] Activation of the development schedule status-control function 66 displays the list of the above-mentioned WBS unit processes from the process control table 15 on the basis of the product name 54 ( drawing 4 ) inputted from I/O device 13. An operator's 11 input of the completion scheduled day to each above-mentioned WBS unit process by which the list display was carried out registers this completion scheduled day into the process control table 15 on the basis of the product name 54 and WBS unit-process ID55 ( drawing 4 ).

[0086] When design work is advancing, the progress status list of the WBS unit processes 55 is displayed like the example 67 of a screen display. The interrelation of WBS unit-process ID55 is easily obtained from the product process procedure master table 16.

[0087] The methods of registering the "completing date" item 68 for displaying the progress status on the process control table 15 differ by WBS unit-process ID55 with tool support, and WBS unit-process ID55 without tool support. In WBS unit-process ID55 without tool support, the "completing date" item 68 which the operator 11 inputted with I/O device 13 is registered into the process control table 15.

[0088] By WBS unit-process ID55 with tool support, it is as follows to it. When ending the design work by the CAD tool 4 first, operator 11 self chooses a work interruption for whether design work was completed,

and inputs into I/O device 13. When the design work itself is completed, the tool motion-control manager 3 registers automatically the day which completed design work as a "completing date" item 68 of the process control table 15. This registration is not performed when work is interrupted to it.

[0089] When drawing 7 is referred to, the parts library management function 96 is the tool motion-control manager ability 3, and is for changing into integration parts informations (a parts name, parts unit price, etc.) the parts information for every tool used with the CAD tool 4 which is performing motion control, the CAE tool 5, the CAM tool 6, the CAT tool 7, and the CAPP tool 8 (refer to the drawing 2 ), and managing it in the parts library table 49.

[0090] If an operator 11 starts the product library management function 96, the right of registration will be judged by an operator's 11 login name.

[0091] When the concerned right of registration exists, further, on I/O device 13, from WBS unit-process ID55 ( drawing 5 ) by which the list display was carried out, an operator 11 chooses the corresponding process ID and inputs the corresponding product name value 37 ( drawing 2 ). When inputted WBS unit-process ID55 is processed with the possible tool of library-izing, the demanded content of drawing of the applicable tool of WBS basic-process ID55 will be displayed on I/O device 13. Moreover, when it cannot process with a tool, an error will be returned to I/O device 13.

[0092] If an operator 11 does the mouse click of the parts symbol drawn there, he will receive the input request of parts ID, used tool ID, and the parts attribute of a style of pacing from I/O device 13 further. Then, an operator 11 inputs an applicable value into I/O device 13.

[0093] Then, the product library management function 96 obtains used tool ID56 from the product data table 17 on the basis of the product name value 37 inputted from I/O device 13, and WBS unit-process ID55.

Then, the access-method table 22 is searched with the following conditions 4 and the conditions 5, and the method 31 used by data conversion is obtained. "Partner tool ID95" ( drawing 4 ) of the access-method table 22 is [ conditions / aforementioned / 4 ] in agreement with what was obtained from the product data table 17 in that "self-tool ID94" ( drawing 4 ) of the access-method table 22 is the parts library management function 96, and the aforementioned conditions 5. If the product library management function 96 obtains a method 31, it will read the CAD data file 90, will extract parts ID, a parts name, and a circuit notation from the data of a text format, will use the concerned parts ID and the concerned used tool ID as a key, and will register them into the parts library table 49.

[0094] The product library management function 96 performs the following processing further [ except the item acquired from the CAD data file 90 ]. On the basis of the product name value 37 inputted from I/O device 13, the product library management function 96 reads the product data table 17 one by one, and obtains used tool ID56 corresponding to each WBS unit-process ID55. Then, the access-method table 22 is searched with the following conditions 6 and the conditions 7, and the method 31 used by data conversion is obtained. "Partner tool ID95" ( drawing 4 ) of the access-method table 22 is [ conditions / aforementioned / 6 ] in agreement with what was obtained from the product data table 17 in that "self-tool ID94" ( drawing 4 ) of the access-method table 22 is the parts library management function 96, and the aforementioned conditions 7.

[0095] If the product library management function 96 obtains a method 31, it will read data file 90a which is different in the CAD data file 90, will extract parts ID and other various data from the data of a text format, will use the concerned parts ID and the concerned used tool ID as a key, and will carry out additional registration in the parts library table 49.

[0096] Drawing 8 shows the relation of the above-mentioned process control table of the above-mentioned product data integration management database, and the above-mentioned product process procedure master table to the man day statistical information capture function in drawing, an evaluation statistical information capture function, a statistical-analysis function, a man day estimation function, an entry receptionist function and the above-mentioned access-method table of the above-mentioned product data integration management database, a statistical-data table, and a statistics master table. [0097] The man day estimation function 74 presumes the man day of the product registered by the entry receptionist function 1 from the product data table 17 in the manufacture data integration management database 14, the process control table 15, the statistical-data table 50, the statistics master table 51, the method 31, and the log file 20.

[0098] The man day statistical information capture function 71 is a function to collect the man day statistical information of the product developed in the past from the process control table 15 in the manufacture data integration management database 14, the statistical-data table 50, and the log file 20.

[0099] The evaluation statistical information capture function 72 is a function to collect the evaluation point informations on the product developed in the past from the product data table 17 in the manufacture data integration management database 14, the statistical-data table 50, the access-method table 22, and the



method 31. The statistical-analysis function 73 is a function to analyze the statistical information of the product developed in the past, and to register the analysis result into the statistics master table 51 from the process control table 15 in the manufacture data integration management database 14, and the statistical-data table 50.

[0100] When a series of development work of the product 69 inputted by the entry receptionist function 1 is completed and it becomes mass-production start, the activate-request event 42 to the man day statistical information capture function 71 from a production control system 70 occurs. According to the demand event 42, the man day statistical information capture function 71 starts, and the following man day accumulating-totals processings are performed.

[0101] There, list reference of the instance 36 which is equivalent to WBS basic process which stands on the key as for the adopted flag registered into the process control table 15 in the product name of a product 69 is performed.

[0102] Then, the man day statistical information capture function 71 creates the instance 36 of the process control table 15, and the instance 76 of the statistical-data table 50 of this affair. The key items of the statistical-data table 50 are the name of a product 69, and the above-mentioned WBS unit-process-ID. Moreover, as a data item of the statistical-data table 50, a process start time, a finish time, accumulation working hours, a work man day, the number of starts, a login name, and the evaluation point exist. Then, the man day statistical information capture function 71 searches an instance 76 for the name of a product 69 from the statistical-data table 50 one by one to a key.

[0103] The man day statistical information capture function 71 takes out two or more records 24 with the name of the same product 69 as the instance 76 which read the instance 76 from the record 24 of a log file 20 after one affair reading \*\*\*\*\*, and the above-mentioned WBS unit-process ID, and counts the number of cases. Then, the man day statistical information capture function 71 calculates the activation start time of the beginning of the tool used by the above-mentioned WBS unit-process ID which corresponds from this record 24, the maximum finish time and accumulation working hours, the number of starts, and a work man day. Then, the man day statistical information capture function 71 indicates the above-mentioned activation start time, the above-mentioned maximum finish time and the above-mentioned accumulation working hours, the above-mentioned number of starts, and the above-mentioned work man day to the read instance 76. The evaluation point item 78 is not set to the read instance 76.

[0104] When the man day statistical information capture function 71 performs processing about the above-mentioned WBS unit process which does not have tool support among the instances 76 of the statistical-data table 50, the following housekeeping performs. As the 1st procedure, the man day statistical information capture function 71 searches the name of a product 69 for ID of the tool support WBS unit process which gets mixed up in this WBS unit process without the above-mentioned tool support from the process control table 15 to a key. As the 2nd procedure, the man day statistical information capture function 71 searches the record 24 of a log file 20 for the name of the above-mentioned tool support WBS unit-process ID and the product 69 equivalent to the last process of this WBS unit process which were searched to a key, and deduces a finish time. As the 3rd procedure, the man day statistical information capture function 71 searches the record 24 of a log file 20 for the name of the above-mentioned tool support WBS unit-process ID and the product 69 equivalent to the back process of this WBS unit process which were searched to a key, and deduces a start time. As the 4th procedure, the man day statistical information capture function 71 calculates WBS unit-process working hours without the above-mentioned tool support, and deduces a man day from the difference of the above-mentioned last time and the above-mentioned start time.

[0105] the finish time of the log record 24 with which the man day statistical information capture function 71 is equivalent to the tool support WBS unit process of the process before the above-mentioned when two or more log records 24 in which the above-mentioned tool activation is described exist in the 2nd above-mentioned procedure -- checking -- this finish time -- large -- and -- the maximum -- the log record 24 of the same tool support WBS unit process with a finish time is searched When it is able to search, the man day statistical information capture function 71 adopts the finish time of this log record 24.

[0106] When two or more log records 24 in which the above-mentioned tool activation is described exist in the 3rd above-mentioned procedure, the man day statistical information capture function 71 checks the start time of the log record 24 equivalent to the tool support WBS unit process of the process after the above-mentioned, and searches the log record 24 of the same tool support WBS unit process with a start time [ smaller / than this start time / and minimum ]. When it is able to search, the man day statistical information capture function 71 adopts the start time of this log record 24. Moreover, also with WBS unit process without the above-mentioned tool support, when the record 24 of a log file 20 is created in electronic mail and a manual input, the man day statistical information capture function 71 uses this log record 24,

calculates the above-mentioned activation start time, the above-mentioned maximum finish time and the above-mentioned accumulation working hours, and the above-mentioned number of starts, and calculates a work man day.

[0107] The man day statistical information capture function 71 starts the evaluation statistical information capture function 72, just before ending the above-mentioned man day accumulating-totals processing. Within the data file 34 created or referred to, the CAD tool 4 used by the development phase of a product 69, the CAE tool 5, the CAM tool 6, the CAT tool 7, or the CAPP tool 8 takes out the parameter 77 which affects this tool warm-up time most, and uses the evaluation statistical information capture function 72 as the evaluation point 78.

[0108] The parameter 77 used as the evaluation point 78 and its calculation technique 79 are registered into the decided method 31 which exists in the method registration directory 75. The evaluation statistical information capture function 72 reads the name of a product 69 into a key for the statistical-data table 50 one by one. Then, the evaluation statistical information capture function 72 draws a method 31 from the method table 22. Then, the evaluation statistical information capture function 72 calls this method 31 that exists in the method registration directory 75. Then, the evaluation point 78 is calculated.

[0109] Then, the evaluation point 78 is returned to the evaluation statistical information capture function 72. Then, the evaluation statistical information capture function 72 reads the instance 76 of the statistical-data table 50 for the name of a product 69, and the above-mentioned WBS unit-process ID to a key, and indicates the evaluation point item 78. the instance 76 whose product 69 of the statistical-data table 50 corresponds work of the above [ the evaluation statistical information capture function 72 ] -- it carries out to all When the method 31 which calculates the evaluation point 78 cannot be defined, the evaluation statistical information capture function 72 starts fixed value setting method 31a, and false evaluation point 78a is given.

[0110] The evaluation statistical information capture function 72 starts the statistical-analysis function 73, just before ending processing. This statistical-analysis function 73 receives activation, whenever the new data for a statistics are generated. To the process control table 15, this statistical-analysis function 73 adds projection data processing about a pattern name item, and acquires all the pattern modality informations 80. Then, this statistical-analysis function 73 carries out list reference of the instance 36 of the process control table 15 which is in agreement with the first pattern indicated by all the pattern modality informations 80, in order to ask for the relation between the evaluation point 78 and a man day every pattern modality informations 80 of all. Then, this statistical-analysis function 73 calculates the natural-logarithm value 82 of the sum man day computed by the natural-logarithm value 81 of the evaluation point 78 which asks a key for all the instances 76 from the statistical-data table 50, and was indicated by this instance 76, and calculation in the above-mentioned WBS basic-process ID indicated by the instance 36 by which list reference was carried out.

[0111] This statistical-analysis function 73 calculates the natural-logarithm value 82 of the sum man day computed by the natural-logarithm value 81 of the evaluation point 78, and the above-mentioned calculation from all the instances 76, and presumes the value of the proportionality coefficient Kpi of following the (1) formula, and the value of the exponent coefficient tpi using a least squares method. Moreover, distributed value sigmaNpi It asks. Kpi value, tpi value, and distributed value sigmaNpi By asking, the man day corresponding to the arbitrary evaluation point 78 can be presumed. the above -- this statistical-analysis function 73 -- every above-mentioned pattern -- the instance 36 of the process control table 15 -- all -- receiving -- moreover, all pattern modality informations a80 \*\*\*\* -- it processes to all patterns Nhpi=Kpi\*(Pi) tpi .... For (1), however Nhpi, the presumed man day of WBS unit-process i under process pattern p and Kpi are the proportionality coefficient of WBS unit-process i under process pattern p, and Pi. The evaluation point of WBS unit-process i under process pattern p and tpi are the exponent coefficients of WBS unit-process i under process pattern p.

[0112] Then, it asks for all the instances 76 from the statistical-data table 50, and this statistical-analysis function 73 is (2), (3), and (4) below. A formula is calculated.

[0113]

$$H_{p,j} = N h_{p,j} / \sum_{i=1}^{80} (N h_{p,i,j}) \quad \text{.....(2)}$$

However, Hp*ij* The rate of distribution and Nh*pij* to all the man days of WBS unit-process i of process pattern p product j The actual condition all man day of WBS unit-process i of process pattern p product j and



Nps are all WBS unit-process instances of process pattern p.

[0114]

$$\gamma_{pi} = \frac{\sum_j H_{pij}}{\sum_{i=1}^{N_p} \sum_j H_{pij}} \quad \dots\dots(3)$$

[0115] However, gammapi is the rate of mean distribution of WBS unit-process i of process pattern p.

$$\sigma_{rpi}^2 = \{ \sum_j (\gamma_{pi} - H_{pij})^2 \} / j \quad \dots\dots(4)$$

Then, this statistical-analysis function 73 registers process pattern p and the above-mentioned WBS unit process into the key for the following data 85, 86, 87, and 88 in the statistics master table 51. Then, the statistical-analysis function 73 ends processing.

WBS unit process Proportionality coefficient of i (85) : Kpi WBS unit process Exponent coefficient of i (86) : tpi WBS unit process Rate of mean distribution (87): gammapi variance value sigmaNpi of i, and distributed value sigma rpi (88)

If the man day estimation function 74 is started, an operator 11 will perform the input of 69 products. Then, the instance 36 by which the man day estimation function 74 added the name of a product 69 to the key, and added unfinished [ "unfinished" ] or the "end" flag to STATUS flag from the process control table 15 is retrieved sequentially.

[0116] Among instances 36, about the aforementioned tool support WBS unit process, the product data table 17 is searched further and the process instance 18 is drawn as the man day estimation function 74 searches. Then, from the record 24 of the log file 20 corresponding to the name of the product 69 inputted as WBS unit-process ID with the process instance 18 read and applied, the man day estimation function 74 searches the start time and finish time of a tool, and calculates pre-forecast man day Nhbpi of applicable WBS unit process. The result is written down in the temporary file 83.

[0117] When processing about the aforementioned WBS unit process which does not have tool support while the man day estimation function 74 searches an instance 36 one by one, it processes to the following housekeeping. As the 1st procedure, the man day estimation function 74 searches 69 products for the aforementioned tool support WBS unit-process ID which gets mixed up in this WBS unit process without tool support from the process control table 15 to a key. As the 2nd procedure, the man day estimation function 74 searches the record 24 of a log file 20 for the name of the aforementioned tool support WBS unit-process ID and the product 69 equivalent to the last process of this WBS unit process which were searched to a key, and deduces the last finish time. As the 3rd procedure, the man day estimation function 74 searches the record 24 of a log file 20 for the name of the aforementioned tool support WBS unit-process ID and the product 69 equivalent to the back process of this WBS unit process which were searched to a key, and deduces the first start time. as the 4th procedure, the man day estimation function 74 has no above-mentioned tool support from the difference of the aforementioned last time and a start time -- WBS unit-process working-hours guess is carried out, and pre-forecast man day Nhbpi \*\* is calculated The result is written down in the temporary file 83. by the above technique, when the man day estimation function 74 starts, it has ended and begun -- WBS unit-process working-hours guess is carried out [ aforementioned ], and pre-forecast man day Nhbpi \*\* is calculated Then, the man day estimation function 74 reads the method 31 which asks for the evaluation point 78 from the method directory 75, and calculates the evaluation point 78 from the data file 34 by which the point is carried out by the process instance 18. Then, from the statistics master table 51, the man day estimation function 74 searches the aforementioned process proportionality constant of the corresponding above-mentioned WBS unit process, and an exponent constant, and calculates forecast man day Nhapi after the above. The result is written down in the temporary file 84. then, the instance 36 by which, as for the man day estimation function 74, unfinished [ "unfinished" ] or the "end" flag added the name of a product 69 to STATUS flag obtained from the process control table 15 by the key - the above-mentioned processing is performed to all

[0118] The man day estimation function 74 performs after that a man day forecast of the aforementioned unsettled WBS unit process corresponding to the instance 36 which "it is unsettled" added to STATUS flag of the process control table 15. Then, pre-forecast man day Nhbpi the man day estimation function 74 is indicated to be by the temporary file 83, A comparison of post-forecast man day Nhapi indicated by the temporary file 84, And the parameter registered into the statistics master table 51, i.e., rate gammapi of

mean distribution of WBS unit-process i, distributed value  $\sigma_{Np_i}$ , and distributed value  $\sigma_{r_{p_i}}$  Four parameters (5) which it pulls out and are the following, (6), (7), (8), and (9) A formula is calculated.

1) It is drawn from each man day of a theoretical worst value aforementioned WBS unit process being independent as follows.

$$\begin{aligned} & \sum_{i=1}^n \max (Nh a_{p_i}, Nh b_{p_i}) + (Nh b_{p_k} / r_{p_k}) - \\ & \sum_{i=1}^n (Nh b_{p_k} * r_{p_i} / r_{p_k}) + \\ & \sum_{k=n+1}^{Np} \{ 1.96 \sigma_{r_{p_i}} * j^{-0.5} * (Nh b_{p_k} / r_{p_k}) \} \dots\dots(5) \end{aligned}$$

however, k -- Nhbpk-Nhapk -- the processes id and n of Max -- an instance 36 -- "an end" or an "unfinished" flag -- being attached .

$$\begin{aligned} & \sum_{i=1}^n \max (Nh a_{p_i}, Nh b_{p_i}) + (Nh b_{p_k} / r_{p_k}) - \\ & \sum_{i=1}^n (Nh b_{p_k} * r_{p_i} / r_{p_k}) \dots\dots(6) \end{aligned}$$

2) A theoretical usual upper limit

3) It is all WBS unit processes with which the "end" or the "unfinished" flag was attached to the instance 36, and the value of theoretical \*\*\*\*\* is (7) below. It is adapted when a formula is materialized.

[0119]

$$0 \leq |Nh b_{p_i} - Nh a_{p_i}| \leq 1.96 \sigma_{Np_i} * j^{-0.5} \dots\dots(7)$$

[0120]

$$\sum_{i=1}^n Nh b_{p_i} + \{ \{ \sum_{i=1}^n (Nh a_{p_i} / r_{p_i}) \} / n \} * \{ \sum_{k=n+1}^{Np} r_{p_k} \} \dots\dots(8)$$

4) It is drawn from each man day of a theoretical best value aforementioned WBS unit process being independent as follows.

$$\begin{aligned} & \sum_{i=1}^n Nh b_{p_i} + \{ \{ \sum_{i=1}^n (Nh b_{p_i} / r_{p_i}) \} / n \} * \\ & \{ \sum_{k=n+1}^{Np} (r_{p_k} - 1.96 \sigma_{r_{p_k}} * j^{-0.5}) \} \dots\dots(9) \end{aligned}$$

Then, the man day estimation function 74 displays the value drawn on I/O device 13 with the value of the above-mentioned (5), (6), (8), and (9) formula. Thereby, the forecast of a man day of an operator 11 is attained. Moreover, an operator 11 can guess the development cost of the development product 69 by the designs B/M91 which design B / M creation function 89 creates.

[0121]

[Effect of the Invention] The effect of being done so by this invention is as follows.

[0122] Since the unitary management of the product data generated in atypical can be carried out according to the product data integration management database and development management framework of this invention, when required, it can obtain [ 1st ] in a required format. therefore, the conversion procedure of the \*\*\*\*\* files 25 and 25a of drawing 2 -- being unnecessary -- even if it becomes, the reliability of data improves as a result and it changes the whereabouts of the data files 25 and 25a of drawing 2 further -- the

limitation in which the data control function 2 of drawing 2 is possible -- since an automatic maintenance is performed, the reliability of data improves

[0123] Since the man day estimation function 74 described in drawing 8 presents [ 2nd ] timely development progress according to the product data integration management database and development management framework of this invention, a forecast of a development cost can be performed.

[0124] Since the unitary management of the product data generated in atypical can be carried out according to the product data integration management database and development management framework of this invention, [ 3rd ] When required, even if can obtain in a required format, therefore the conversion procedure of the \*\*\*\*\* files 25 and 25a of drawing 2 becomes unnecessary, the reliability of data improves as a result and it changes the whereabouts of the data files 25 and 25a of drawing 2 further the limitation in which the data control function 2 of drawing 2 is possible -- since an automatic maintenance is performed, the reliability of data improves

[0125] According to this invention, progress grasp of development business and a management are attained [ 4th ] regardless of an organization and arrangement.

[0126] Since the loose-coupling method is adopted [ 5th ] as the hold technique of data according to this invention, about data-hold, it is flexible.

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Field

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[Field of the Invention] this invention relates to the product data integration management database and the Seki management framework which are applied to the business carried out in the technical section of the device industry which makes subassembly a subject among manufactures about a database and a framework especially, a design section, an IE section, a manufacturing department, and a management section about the technique of operating the data sequence or the content dealt with with a digital computer, and processing data.

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## Technique

[Description of the Prior Art] The conventional technique is shown in drawing 10. Arbitrary products 101 When designing, an operator 123 is the design integrated framework function 102. It starts. Design integrated framework function 102 When it starts, it is the data storage field 103. Since it must specify, it is an operator 123. Product 101 Data file 109,110,111 Machine 104 to store A name and directory 105 It is the design integrated framework function 102 about a name. It inputs.

[0003] Design integrated framework function 102 Low-ranking CAD tool 106,106a, the CAE tool 107, and CAT tool 108 Directory 105 into which the store place of the data files 109,109a and 110,111 to create was inputted It sets up. Then, CAD tool 106 which should be used for the beginning among CAD tool 106,106a which exists partly It is used and is a product 101. It is designed. Consequently, CAD tool 106 Data file 109 created Inputted directory 105 It is created by the subordinate. CAD tool 106 which should be used first Data file 109a created by this CAD tool 106a when designing the following process by another CAD tool 106a, after completing a design is also a directory 105. It is stored.

[0004] Design [ after using CAD tool 106,106a and ending a series of design procedure ] integrated framework function 102 By the CAM tool 112 which a subordinate does not have, it is the manufacture relation data file 113. It is a directory 105 when creating. Data file 109 which exists in a subordinate File transfer program 114,114a is minded and it is the CAM tool 112. Own directory 115 It copies to a subordinate. Copy data file 109a is created as a result of a copy. Then, operator 123 The concerned copy data file 109a is minded, and it is the CAM tool 112. It processes.

[0005] CAM tool 112 In case it processes, it is the concerned CAM tool 112 about the format of data file 109a as pretreatment. It is an operator 123 in order to change into a peculiar format. Conversion program 116 It starts. This conversion program 116 It is the interval generation file 117 as a result of activation. It is created. Operator 123 Conversion program 116 Interval generation file 117 Concerned CAM tool 112 after creating It starts. CAM tool 112 When processing by another different CAM tool 112a, it is a conversion program 116. Another different conversion-program 116a must be prepared, and it must change into the format that CAM tool 112a corresponds.

[0006] It is the design integrated framework function 102. A subordinate's CAD tool 106 Data file 109 created It is an operator 123 when a version is updated. A conversion program 116 and interval generation file 117 It must be used and the same procedure must be performed again.

[0007] Moreover, CAM tool 112 Different tool 118 It is a data file 109. It is the CAD tool 106, without using it. It is the output space 119 about a result. You have to adopt the technique of reading using a digitizer 120 after a printing.

[0008] Design integrated framework function 102 Whenever it controls activation of a subordinate's CAD tool 106,106a, and an operation of a halt, it is a log file 121. Record 122 It appends. The concerned file 121 From the content, an operation of each CAD tool 106,106a can be checked. However, file 121 Product 101 It is not used as development schedule status-control data. Therefore, product 101 When carrying out a development schedule status control, it is the design integrated framework function 102. Operator 123 who uses a subordinate's CAD tool 106,106a Self-assessment document 125 to fill in It will refer to and correspond. Moreover, product 101 A management of a man day, a forecast, and a cost forecasting are an operator 123. Self-assessment document 125 A hand calculation or the status-control system after EDP input will perform based on the obtained data.

[0009] Design integrated framework function 102 About data file 109,109a which a subordinate's CAD tool 106,106a created, it is another system 124. When distributing, file transfer program 114,114a is used. In this case, since the status of data file 109,109a and 110,111 [ themselves ] is not necessarily managed, the file transfer also of developing data becomes possible.

[0010] JP,4-336382,A is mentioned as well-known data near the conventional technique explained above.

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## Effect

[Effect of the Invention] The effect of being done so by this invention is as follows.

[0122] Since the unitary management of the product data generated in atypical can be carried out according to the product data integration management database and development management framework of this invention, when required, it can obtain [ 1st ] in a required format. therefore, the conversion procedure of the \*\*\*\*\* files 25 and 25a of drawing 2 -- being unnecessary -- even if it becomes, the reliability of data improves as a result and it changes the whereabouts of the data files 25 and 25a of drawing 2 further -- the limitation in which the data control function 2 of drawing 2 is possible -- since an automatic maintenance is performed, the reliability of data improves

[0123] Since the man day estimation function 74 described in drawing 8 presents [ 2nd ] timely development progress according to the product data integration management database and development management framework of this invention, a forecast of a development cost can be performed.

[0124] Since the unitary management of the product data generated in atypical can be carried out according to the product data integration management database and development management framework of this invention, [ 3rd ] When required, even if can obtain in a required format, therefore the conversion procedure of the \*\*\*\*\* files 25 and 25a of drawing 2 becomes unnecessary, the reliability of data improves as a result and it changes the whereabouts of the data files 25 and 25a of drawing 2 further the limitation in which the data control function 2 of drawing 2 is possible -- since an automatic maintenance is performed, the reliability of data improves

[0125] According to this invention, progress grasp of development business and a management are attained [ 4th ] regardless of an organization and arrangement.

[0126] Since the loose-coupling method is adopted [ 5th ] as the hold technique of data according to this invention, about data-hold, it is flexible.

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TECHNICAL PROBLEM

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[Problem(s) to be Solved by the Invention] There are the following technical problems in the conventional technique explained above.

[0012] Sharing-izing the data contained [ 1st ] in data files 109,109a and 110,111 Design integrated framework function 102 A subordinate's CAD tool 106,106a, the CAE tool 107 and CAT tool 108 it can accept, come out and do 却 \*\*\*\* -- not passing -- data file 113 of CAM tool 112,112a Since the technique of managing does not exist It must re-create one by one using conversion-program 116,116a, and is a data file 113. Since a whereabouts will be changed simply, it is this data file 113. It may lose.

[0013] To the 2nd, the status control of a development schedule and a forecast of a man day are an operator 123 with the conventional technique. Self-assessment document 125 to create Related data are collected, the hand calculation or the status-control system after EDP input is performing on the basis of it, by such technique, timely grasp of development progress and a forecast of a development cost cannot be performed, but the design change on account of a cost reduction becomes impossible.

[0014] To the 3rd, it is a product 101 with the conventional technique. Subordinate data control is an operator 123. It depends and it is not managed where data files 109,109a and 110,111,113 actually exist.

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MEANS

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[Means for Solving the Problem] The process control table which this invention decomposes all the business at the time of developing and manufacturing arbitrary products into a smallest unit, systematizes this business, adds the same recognition number, and manages a subordinate information by the product name and the same above-mentioned recognition number, The product process procedure master table containing the former data at the time of creating this process control table, CAD (Computer Aided Design) tool, among the aforementioned process control tables, CAM (Computer Aided Manufacturing) tool, CAT (Computer Aided Testing) tool, CAE (Computer Aided Engineering) tool, And the process which receives tool support of CAPP (Computer Aided Process Planning) tool is extracted. The product data table which specifies the store place of the data which manage a subordinate information by the aforementioned product name and the same aforementioned recognition number, and the aforementioned CAD tool, the aforementioned CAM tool, the aforementioned CAT tool, the aforementioned CAE tool, and the aforementioned CAPP tool create, The aforementioned CAD tool, the aforementioned CAM tool, the aforementioned CAT tool, the aforementioned CAE tool, The distribution address table which has managed the subordinate information on the address of a system with reference to the case where the data which each tool of the aforementioned CAPP tool creates are distributed to the system besides a management of a development management framework, In the product data integration management database possessing the parts library table which carries out the unitary management of the parts used in case a product is developed The start time of WBS (Work Breakdown Structure) basic process registered into the aforementioned process control table about the product designed in the past, A finish time, accumulation working hours, a work man day, and the statistical-data table that manages the evaluation point of the process, The statistics master table which records the statistical information parameter drawn from the product designed in the past, The distribution management table which records the management matter about this distribution work, and the aforementioned CAD tool, The data which the arbitrary tool of the aforementioned CAM tool, the aforementioned CAT tool, the aforementioned CAE tool, and the aforementioned CAPP tool creates When another arbitrary tool reads, it is characterized by providing the access-method table which manages the method which changes data into the format which suits this tool automatically.

[0016] The process control table which this invention decomposes all the business at the time of developing and manufacturing arbitrary products into a smallest unit, systematizes this business, adds the same recognition number, and manages a subordinate information by the product name and the same above-mentioned recognition number, The product process procedure master table containing the former data at the time of creating this process control table, CAD tool among the aforementioned process control tables, CAM tool, CAT tool, The process which receives tool support of CAE tool and CAPP tool is extracted. The product data table which specifies the store place of the data which manage a subordinate information by the aforementioned product name and the same aforementioned recognition number, and the aforementioned CAD tool, the aforementioned CAM tool, the aforementioned CAT tool, the aforementioned CAE tool, and the aforementioned CAPP tool create, The aforementioned CAD tool, the aforementioned CAM tool, the aforementioned CAT tool, the aforementioned CAE tool, The distribution address table which has managed the subordinate information on the address of a system with reference to the case where the data which each tool of the aforementioned CAPP tool creates are distributed to the system besides a management of a development management framework, It is a product data integration management database possessing the parts library table which carries out the unitary management of the parts used in case a product is developed. The start time of WBS basic process registered into the aforementioned process control table about the product designed in the past, a finish time, accumulation working hours, a work man day, and the statistical-data table that manages the evaluation point of the process, The statistics master table which records the statistical information parameter drawn from the product designed in the past, The distribution management

table which records the management matter about this distribution work, and the aforementioned CAD tool, The data which the arbitrary tool of the aforementioned CAM tool, the aforementioned CAT tool, the aforementioned CAE tool, and the aforementioned CAPP tool creates The aforementioned CAD tool, the aforementioned CAM tool which were registered into the process control table which exists in the product data integration management database possessing the access-method table which manages the method which changes data into the format which suits this tool automatically when another arbitrary tool reads, Activation of the tool of the aforementioned CAT tool, the aforementioned CAE tool, and the aforementioned CAPP tool, Shutdown is controlled. And the aforementioned CAD tool, the aforementioned CAM tool, The data which the tool of the aforementioned CAT tool, the aforementioned CAE tool, and the aforementioned CAPP tool creates It stores in the field indicated in the aforementioned product data table in the aforementioned manufacture data integration management database. The tool motion-control manager ability which records the audit trail of the tool of the aforementioned CAD tool, the aforementioned CAM tool, the aforementioned CAT tool, the aforementioned CAE tool, and the aforementioned CAPP tool on a log file, The parts library management function to manage the aforementioned parts library table which the arbitrary tool of the aforementioned CAD tool, the aforementioned CAM tool, the aforementioned CAT tool, the aforementioned CAE tool, and the aforementioned CAPP tool refers to, In the development management framework which possesses design B / M creation function which creates a bill of materials from the data which the aforementioned CAD tool creates The entry receptionist function to register the instance of the aforementioned WBS basic process which describes the work breakdown which received the event of development start and was decomposed into the smallest unit as finite business in the aforementioned process control table, The data control function to perform a data maintenance of the aforementioned product data table automatically, The development schedule status-control function which displays development schedule progress of the aforementioned product registered by the aforementioned entry receptionist function from the aforementioned process control table and the aforementioned log file, The data distribution FM which transmits the aforementioned data which the arbitrary tool of the aforementioned CAD tool, the aforementioned CAM tool, the aforementioned CAT tool, the aforementioned CAE tool, and the aforementioned CAPP tool creates to an external system according to the applicable status, The aforementioned CAD tool, the aforementioned CAM tool, the aforementioned CAT tool, the aforementioned CAE tool, The method which changes them automatically so that the data format which this tool has may be suited when another tool reads the data which the arbitrary tool of the aforementioned CAPP tool creates, The aforementioned product data table, the aforementioned process control table, the aforementioned statistical-data table, the aforementioned statistics master table, The man day estimation function to presume the man day of the aforementioned product registered by the aforementioned entry receptionist function from the aforementioned access method and the aforementioned log file, The man day statistical information capture function to collect the man day statistical information of the product developed in the past from the aforementioned process control table, the aforementioned statistical-data table, and the aforementioned log file, The evaluation statistical information capture function to collect the evaluation point informations on the product developed in the past from the aforementioned product data table, the aforementioned statistical-data table, the aforementioned access-method table, and the aforementioned access method, It is characterized by providing the statistical-analysis function to analyze the statistical information of the product developed in the past, and to register the analysis result into the aforementioned statistics master table from the aforementioned process control table and the aforementioned statistical-data table.

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## EXAMPLE

[Example] Next, this invention is explained with reference to a drawing. Drawing 1 is a block diagram showing one example of this invention.

[0018] Drawing 2 shows the relation of the entry receptionist function in drawing 1, a product data integration management database, a data control function, and the tool motion-control manager ability to a method.

[0019] Drawing 3 shows the detail of the process control table in drawing 2, a product process procedure master table, a product data table, a distribution address table, a parts library table, the access-method table that the product data integration management database constituted including a log file holds, a distribution management table, a statistical-data table, a statistics master table, the above-mentioned process control table and the above-mentioned product process procedure master table, the above-mentioned product data table, the above-mentioned distribution address table, the above-mentioned parts library table, and the above-mentioned log file.

[0020] Drawing 4 shows the relation with design B / M creation function to the access-method table of the above-mentioned product data integration management database in drawing 1 and the above-mentioned process control table of the above-mentioned product data integration management database, and the above-mentioned product data table.

[0021] Drawing 5 shows the relation of the product data table of the above-mentioned product data integration management database to the data distribution FM in drawing 1, a distribution address table, and a distribution management table.

[0022] Drawing 6 shows the relation of the above-mentioned tool motion-control manager ability to the development schedule status-control function in drawing 1, the above-mentioned process control table of the above-mentioned product data integration management database, and the above-mentioned product process procedure master table.

[0023] Drawing 7 shows the relation of the parts library management function in the above-mentioned development management framework to the access-method table and method of the above-mentioned product data integration management database in drawing 1.

[0024] Drawing 8 shows the relation of the above-mentioned process control table of the above-mentioned product data integration management database, and the above-mentioned product process procedure master table to the man day statistical information capture function in drawing 1, an evaluation statistical information capture function, a statistical-analysis function, a man day estimation function, an entry receptionist function, the above-mentioned access-method table of the above-mentioned product data integration management database, a statistical-data table, and a statistics master table.

[0025] The representation technique of a parentage in a version-control method is shown in drawing 9.

[0026] Next, with reference to drawing 2, the relation of the above-mentioned entry receptionist function, the above-mentioned product data integration management database, the above-mentioned data control function, and the above-mentioned method and the above-mentioned tool motion-control manager ability is explained in detail.

[0027] The tool motion-control manager ability 3 performs the motion control of the tool of the CAD tool 4, the CAE tool 5, the CAM tool 6, the CAT tool 7, and the CAPP tool 8, and an environmental control, and adds the function of the above-mentioned method reading to what is called from the former EDA (Electric Design Automation) framework function.

[0028] In the entry receptionist function 1, it is the function to register the newly developed product and to register the development process of this product.

[0029] The product data integration management database 14 is what manages the data file 25 which each tool of the CAD tool 4, the CAM tool 6, the CAT tool 7, the CAE tool 5, and the CAPP tool 8 creates, and

its access technique. The process control table 15 which develops a product, is what described the work breakdown at the time of manufacturing, is equivalent to an operating flow management table, and exists from the former, The product process procedure master table 16 which offers the former data of the process control table 15, The product data table 17 with the structure seen by the filing system in EDA framework, In the distribution address table 47 which has managed the correspondence relation between a network address and a system, and is equivalent to the conventional object dictionary, and CAD tool The parts library table 49 which exists from the former is included. in CAD tool The access-method table 22 of the new definition which the access technique of data is specified and manages the method which is also a data-conversion program while the log file 20 which exists from the former is included, The start time of WBS basic process registered into the distribution management table 48 and the process control table 15 of the new definition which manages distribution to an external system, It is constituted including the statistical-data table 50 of the new definition which manages a finish time, accumulation working hours, a work man day, and the evaluation point of the process, and the statistics master table 51 of the new definition which records the statistical information parameter drawn from the product designed in the past.

[0030] The data control function 2 performs automatically a data maintenance of the product data table 17 in the product data integration management database 14.

[0031] If an activate request 35 is received through I/O device 13, in order that the entry receptionist function 1 may prepare a development of the product name specified by the activate request 35, it searches the process control table 15 in the product data integration management database 14, and confirms whether the instance 21 with the product name inputted by the entry receptionist function 1 exists.

[0032] About an instance 21, when the instance 21 does not exist, in order that the entry receptionist function 1 may register a product name and WBS unit process into the process control table 15 and only an applicable affair may register it at a search key, it becomes an operator's 11 input work waiting.

[0033] The standardization activities in the organization to which the above-mentioned WBS unit process is the work unit which constitutes development work of the above-mentioned product, and an operator 11 belongs define clearly. Usually, the above-mentioned WBS unit process of a 100 number - a-1000 number is registered into the process control table 15 per product.

[0034] This WBS unit process is registered into the product process procedure master table 16. When only WBS unit-process relevance affair registers an instance 21 into the process control table 15 by the entry receptionist function 1, an operator 11 selects all the instances 36 by which the list reference display is carried out from the product process procedure master table 16 on I/O device 13.

[0035] When not performing an arbitrary WBS unit process in the development process of the above-mentioned product, an operator 11 should just generate the abandonment event 29 on I/O device 13.

[0036] Then, if an operator 11 generates the input end event 30, an instance 21 will be registered into a key only for an applicable affair in the above-mentioned product name and the above-mentioned WBS unit process in the process control table 15.

[0037] A non-adopted flag is set to the process adoption flag of the corresponding instance 21 in case the above-mentioned arbitrary WBS unit process which especially the abandonment event 29 generated is registered into the process control table 15. An operator 11 can register the instance 21 of the process control table 15 easily by the above-mentioned technique.

[0038] WBS unit process which will receive tool support if the entry receptionist function 1 registers the instance 21 of the quantity corresponding to the above-mentioned product and the above-mentioned WBS unit process into the process control table 15 is extracted, and the above-mentioned product name and the above-mentioned WBS unit process are packed into the product data table 17 in the above-mentioned product data integration management database, the process instance 18 of the applicable number of cases is packed into a key, and it registers.

[0039] Whenever the tool of the CAD tool 4, the CAE tool 5, the CAM tool 6, the CAT tool 7, and the CAPP tool 8 generates newly the data file 25 relevant to the above-mentioned product, the store machine and the origin directory 26 of this data file 25, and the status are written down in this process instance 18.

[0040] When it is going to start the tool of the CAD tool 4, the CAE tool 5, the CAM tool 6, the CAT tool 7, and the CAPP tool 8 for development start of an operator 11, the tool motion-control manager ability 3 starts as pretreatment. This tool motion-control manager ability 3 performs a starting control of each tool of a subordinate's CAD tool 4, the CAE tool 5, the CAM tool 6, the CAT tool 7, and the CAPP tool 8.

[0041] This tool motion-control manager ability 3 performs the input request of the above-mentioned product name which rises and was sometimes inputted by the entry receptionist function 1 at the operator 11.

[0042] If the product name value 37 inputted by the entry receptionist function 1 is inputted through I/O

device 13, this tool motion-control manager ability 3 will search the process instance 18 of the product data table 17 to a key, and will carry out the list display of this product name value 37 at I/O device 13. An operator 11 selects the corresponding process instance 18 out of the above-mentioned list display.

[0043] When reference of this process instance 18 can be performed and the above-mentioned store machine which is the arrangement place of a data file 25, and the origin directory 26 are indicated, the data file 25 will already have existed. In this case, an operator 11 performs the input (the update displacement and either of the new editions are specified) of a version and the access technique specification 38 to this tool motion-control manager ability 3.

[0044] Although the process instance 18 exists as a result of this tool motion-control manager ability's 3 searching the product data table 17, when the above-mentioned store machine which is the arrangement place of a data file 25, and the origin directory 26 are not indicated, the above-mentioned WBS unit process which still corresponds will not be worked.

[0045] In this case, an operator 11 inputs the store machine by which the data file 25 which is the store place of the data which each tool of the CAD tool 4, the CAE tool 5, the CAM tool 6, the CAT tool 7, and the CAPP tool 8 generates belongs, and the identifier data 39 of the origin directory 26 to this tool motion-control manager ability 3 through I/O device 13.

[0046] This tool motion-control manager ability 3 overwrites the store machine and the origin directory 26 which were inputted at the selected process instance 18.

[0047] When especially the CAD tool 4 is unified and it is considering as the EDA framework 9, this origin directory 26 of the data file 25 in which this EDA framework 9 carries out a batch management is indicated.

[0048] Then, since a data file 25 will be generated by this store machine and the origin directory 26, this tool motion-control manager ability 3 hangs a read&write lock on the selected process instance 18, and prevents from using it for it from other tools to them.

[0049] Then, the tool motion-control manager ability 3 creates the key file 19 which described the above-mentioned product name inputted by the entry receptionist function 1 to the above-mentioned store machine and origin directory 26 subordinate.

[0050] then, a subordinate's CAD tool 4 with which self has managed this tool motion-control manager ability 3 from the process instance 18 chosen by the operator 11, the CAE tool 5, the CAM tool 6, the CAT tool 7, or the CAPP tool 8 -- in order to start a tool, the activation event 42 is published

[0051] Whenever the tool motion-control manager ability 3 starts the tool of a subordinate's CAD tool 4, the CAE tool 5, the CAM tool 6, the CAT tool 7, and the CAPP tool 8, it generates the log record 24, and it appends it to the file 20 of the decided machine.

[0052] A status ID item (start, an interruption, end), a tool ID item, an event time item, a product name item, and a login-name item are written in a file 20.

[0053] The data file 25 created by the tool of the CAD tool 4 started by the tool motion-control manager ability 3, the CAE tool 5, the CAM tool 6, the CAT tool 7, and the CAPP tool 8 is created by the above-mentioned store machine and temporary file 27 with the another origin directory 26.

[0054] However, in the process instance 18 to which the product data table 17 corresponds, it is the above-mentioned read&write. Since it is locked, a data file 25 cannot be used from the tool of the CAD tool 4 different from the above-mentioned tool in tool motion-control manager ability 3 subordinate's activation condition, the CAE tool 5, the CAM tool 6, the CAT tool 7, and the CAPP tool 8.

[0055] The field where a temporary file 27 is stored is described at the key file 19.

[0056] \*\* [ an end of processing with the CAD tool 4, the CAE tool 5, the CAM tool 6, the CAT tool 7, and the CAPP tool 8 / move / the data file 25 created with the CAD tool 4, the CAE tool 5, the CAM tool 6, the CAT tool 7, and the CAPP tool 8 / the tool motion-control manager ability 3 / from the store field of the temporary file 27 currently described at the key file 19 / to the above-mentioned store machine indicated by the process instance 18 and

[0057] The tool motion-control manager ability 3 obtains the proper global name 23 which should have the data file 25 which the CAD tool 4, the CAE tool 5, the CAM tool 6, the CAT tool 7, and the CAPP tool 8 create from the access-method table 22 in the case of this move treatment.

[0058] Then, the tool motion-control manager ability 3 renames a data file 25 by the above-mentioned proper global name (23) and the version extension.

[0059] In case the tool motion-control manager ability 3 is started as above-mentioned, when the above-mentioned store machine which stores a data file 25 in the process instance 18, and the origin directory 26 are indicated, an operator 11 performs version specification and the input of the access technique to this tool motion-control manager ability 3. The value of the above-mentioned version extension is decided according to this \*\*\*\*\* and this access technique.



[0060] Then, the tool motion-control manager ability 3 releases the above-mentioned read&write lock of the process instance 18 with which the product data table 17 corresponds, and changes it into the status more nearly accessible than other tools. Then, the pathname of the temporary file 27 indicated by the key file 19 is deleted.

[0061] A data file 25 is indicated in the format included in the key file 19 to the above-mentioned version extension as described in drawing 9. The greatest thing of this version extension is a latest edition, and when referred to using a method 31, the thing of this latest edition serves as an object.

[0062] After that, the tool motion-control manager ability 3 generates the log record 24, and appends it to the file 20 of the decided above-mentioned machine.

[0063] The data control function 2 starts on the machine by which the product data integration management database is mounted at the fixed spacing.

[0064] If the data control function 2 starts, the data control function 2 will retrieve the product data table 17 sequentially, and will obtain the pathname of the above-mentioned store machine indicated by the process instance 18 and the origin directory 26.

[0065] Then, the data control function 2 checks presence of a key file 19 from the above-mentioned store machine and the origin directory 26.

[0066] When the data file 25 created with the CAD tool 4, the CAE tool 5, the CAM tool 6, the CAT tool 7, and the CAPP tool 8 moves to the above-mentioned store machine, store machine with the another origin directory 26, and the origin directory 28 and serves as data file 25a by the constraint on disk capacity, and product end, the data control function 2 carries out read lock of the applicable process instance 18 of the product data table 17.

[0067] Then, this data control function 2 publishes the activation event 40 which starts the task 10 which searches for a key file 19.

[0068] When the started task 10 discovers the above-mentioned store machine by which a key file 19 belongs, and the origin directory 28, a task 10 hands over the information 43 on the above-mentioned store machine and the origin directory 28 to the data control function 2, and ends processing.

[0069] The data control function 2 indicates the pathname of this store machine and the origin directory 28 to the process instance 18 of the product data table 17. Then, the above-mentioned read lock is canceled.

[0070] After starting the CAD tool 4, when an operator 11 refers to the data file 25 which the CAD tool 4 created with the CAT tool 7 here, the tool motion-control manager ability 3 which has managed the CAT tool 7 searches the access-method table 22:

[0071] Then, tool motion-control manager 3 function searches a method 31 for tool ID (ID of the CAD tool 4) of a tool to link, and tool ID (ID of this CAT tool 7) of the tool of the subordinate who has managed self from the access-method table 22 to a key, and acquires the method information 44. When two or more applicable instances 45 of a method 31 exist, instance ID is also specified further and a method 31 is specified as the access-method table 22.

[0072] Then, the tool motion-control manager ability 3 draws the above-mentioned store machine and the origin directory 26 from the process instance 18 corresponding to the above-mentioned tool (this CAD tool 4) of the product data table 17. Then, the tool motion-control manager ability 3 performs the method call 41 of the method 31 to which the above-mentioned drew the above-mentioned store machine and the origin directory 26 to the argument.

[0073] From the method registration directory 32, then, the above-mentioned mortgage \*\*\*\*s method 31 It is developed on the memory 12 on the machine by which the data file 25 was stored. The data indicated by the data file 25 of the latest version of the above-mentioned tool (this CAD tool 4) of choice It is changed by the method 31, and it becomes the data.33 of the CAT tool 7, is developed on memory 12, and is transmitted to the machine which has started the tool motion-control manager ability 3 after that.

[0074] The fraction depending on the data file 25 of a tool (tool 4) besides [ which was referred to in order to create data 33 ] the above-mentioned is not indicated by the data file 34 of the CAT data 33 newly created. On work, when these data 33 are needed, the tool motion-control manager ability 3 develops data 33 on memory 12 through a method 31 to whenever [ the ].

[0075] The tool motion-control manager ability 3 is measuring the number of tasks on the partner machine by which the data file 25 of the above-mentioned tool wishing a link is stored just before reading the access-method table 22, and the amount of traffic of the network which connects the machine by which tool motion-control manager ability 3 is mounted.

[0076] When it is late to develop data 33 on memory 12 through a method 31, in case the tool motion-control manager ability 3 performs a method 31, it has a performance top problem, the data file 25 applicable to the disk and memory of the machine by which tool motion-control manager ability 3 is



mounted is copied, and data 33 are obtained after changing by the method 31.

[0077] These data 33 can also be changed into the status that it does not volatilize. However, these data 33 are usually deleted at the time of an end of the tool motion-control manager ability 3.

[0078] As for the process instance 18 of the product data table 17, a read&write lock takes as mentioned above in that case.

[0079] If drawing 4 is referred to, design B / M creation function 89 will output designs B/M on the basis of the result of PWB design. That is, in case the above-mentioned designs B/M are created, CAD data file which PWB design completed is needed. Activation of design B / M creation function 89 creates the above-mentioned designs B/M according to the following procedure. First, on the basis of product name ID54 inputted from I/O device 13, from the process control table 15 ( drawing 3 ), design B / M creation function 89 obtains WBS unit-process ID55 showing PWB design process, and displays the list of the WBS unit processes 55 on I/O device 13. An operator 11 chooses from this list WBS unit process which created the CAD data file 90 used as the former data of designs B/M91 (WBS unit-process ID55 is determined).

[0080] Next, design B / M creation function 89 searches the process instance 18 which satisfies the conditions shown below to the product data table 17, and obtains the whereabouts (package machine ID57, origin directory 58) of the CAD data file 90, and used tool ID56 at the time of the CAD data file 90 creation. The aforementioned conditions are in agreement with what WBS unit-process ID55 of the product data table 17 chose from WBS unit-process list in accordance with that into which product name ID54 of the product data table 17 was inputted from I/O device 13. Furthermore, design B / M creation function 89 searches what fulfills the following conditions 1 - the conditions 3 altogether to the access-method table 22, and obtains the method 31 which should be used for data conversion. That the aforementioned conditions 1 are what the "partition 93" of the access-method table 22 expresses PWB design to, and the aforementioned conditions 2 are that "used tool ID95" of the access-method table 22 is the thing and match which were obtained from the product data table 17 in that "self-tool ID94" of the access-method table 22 is what is the output tool of designs B/M91, and the aforementioned conditions 3. Design B / M creation function 89 reads the CAD data file 90, uses a method 31, extracts items (parts ID, a parts name, circuit notation, etc.) required for design B / M91 creation, after that, from the item, it uses parts ID of the CAD data file 90 as a key, performs exclusion of false parts, or an addition of parts attributes (parts unit price etc.) with reference to the parts library table 49, and creates designs B/M91.

[0081] If drawing 5 is referred to, data distribution FM 52 will transmit manufacture data 60a created by the tool motion-control manager ability 3 using the CAD tool 4 which is having motion control performed, the CAE tool 5, the CAM tool 6, the CAT tool 7, and the CAPP tool 8 to the external system 53. This manufacture data 60a must be effective at the newest. Activation of data distribution FM 52 performs distribution of manufacture data 60a in the other systems 53 according to the following procedure. First, on the basis of product name ID54 inputted from I/O device 13, and WBS unit-process ID55, data distribution FM 52 searches the process instance 18 from the product data table 17, obtains the whereabouts (package machine ID57, origin directory 58) of effective manufacture data 60a, and creates the transfer file 59 by data copy. Next, on the basis of the system name 61 of the destination inputted from I/O device 13, data distribution FM 52 acquires the TCP/IP address 62 of this system from the distribution address table 47, and transmits the transfer file 59 to an alien system 53 (it becomes a data file 60).

[0082] Furthermore, data distribution FM 52 obtains 63 versions of manufacture data 60a transmitted last time from the distribution management table 48 on the basis of product name ID54 of \*\*, WBS unit-process ID55, and the system name 61, raises the 1 edition of 63 versions, and registers it.

[0083] Moreover, abandonment of manufacture data 60a is performed according to the following procedure. Data distribution FM 52 extracts altogether the system name 61 which transmitted manufacture data 60a from the distribution management table 48 on the basis of product name ID54 and WBS unit-process ID55 which were inputted from I/O device 13. Next, data distribution FM 52 acquires the TCP/IP address 62 of this system from the distribution address table 47 on the basis of a system name 61, and notifies abandonment of manufacture data 60a. Simultaneously, data distribution FM 52 considers the status 65 of the distribution management table 48 over a system name 61 as "abandonment", and registers it.

[0084] If drawing 6 is referred to, the development schedule status-control function 66 can grasp easily the progress statuses, such as design work performed by the tool motion-control manager ability 3 using the CAD tool 4 which is having motion control performed, the CAE tool 5, the CAM tool 6, the CAT tool 7, and the CAPP tool 8.

[0085] Activation of the development schedule status-control function 66 displays the list of the above-mentioned WBS unit processes from the process control table 15 on the basis of the product name 54 ( drawing 4 ) inputted from I/O device 13. An operator's 11 input of the completion scheduled day to each

above-mentioned WBS unit process by which the list display was carried out registers this completion scheduled day into the process control table 15 on the basis of the product name 54 and WBS unit-process ID55 ( drawing 4 ).

[0086] When design work is advancing, the progress status list of the WBS unit processes 55 is displayed like the example 67 of a screen display. The interrelation of WBS unit-process ID55 is easily obtained from the product process procedure master table 16.

[0087] The methods of registering the "completing date" item 68 for displaying the progress status on the process control table 15 differ by WBS unit-process ID55 with tool support, and WBS unit-process ID55 without tool support. In WBS unit-process ID55 without tool support, the "completing date" item 68 which the operator 11 inputted with I/O device 13 is registered into the process control table 15.

[0088] By WBS unit-process ID55 with tool support, it is as follows to it. When ending the design work by the CAD tool 4 first, operator 11 self chooses a work interruption for whether design work was completed, and inputs into I/O device 13. When the design work itself is completed, the tool motion-control manager 3 registers automatically the day which completed design work as a "completing date" item 68 of the process control table 15. This registration is not performed when work is interrupted to it.

[0089] When drawing 7 is referred to, the parts library management function 96 is the tool motion-control manager ability 3, and is for changing into integration parts informations (a parts name, parts unit price, etc.) the parts information for every tool used with the CAD tool 4 which is performing motion control, the CAE tool 5, the CAM tool 6, the CAT tool 7, and the CAPP tool 8 (refer to the drawing 2 ), and managing it in the parts library table 49.

[0090] If an operator 11 starts the product library management function 96, the right of registration will be judged by an operator's 11 login name.

[0091] When the concerned right of registration exists, further, on I/O device 13, from WBS unit-process ID55 ( drawing 5 ) by which the list display was carried out, an operator 11 chooses the corresponding process ID and inputs the corresponding product name value 37 ( drawing 2 ). When inputted WBS unit-process ID55 is processed with the possible tool of library-izing, the demanded content of drawing of the applicable tool of WBS basic-process ID55 will be displayed on I/O device 13. Moreover, when it cannot process with a tool, an error will be returned to I/O device 13.

[0092] If an operator 11 does the mouse click of the parts symbol drawn there, he will receive the input request of parts ID, used tool ID, and the parts attribute of a style of pacing from I/O device 13 further. Then, an operator 11 inputs an applicable value into I/O device 13.

[0093] Then, the product library management function 96 obtains used tool ID56 from the product data table 17 on the basis of the product name value 37 inputted from I/O device 13, and WBS unit-process ID55. Then, the access-method table 22 is searched with the following conditions 4 and the conditions 5, and the method 31 used by data conversion is obtained. "Partner tool ID95" ( drawing 4 ) of the access-method table 22 is [ conditions / aforementioned / 4 ] in agreement with what was obtained from the product data table 17 in that "self-tool ID94" ( drawing 4 ) of the access-method table 22 is the parts library management function 96, and the aforementioned conditions 5. If the product library management function 96 obtains a method 31, it will read the CAD data file 90, will extract parts ID, a parts name, and a circuit notation from the data of a text format, will use the concerned parts ID and the concerned used tool ID as a key, and will register them into the parts library table 49.

[0094] The product library management function 96 performs the following processing further [ except the item acquired from the CAD data file 90 ]. On the basis of the product name value 37 inputted from I/O device 13, the product library management function 96 reads the product data table 17 one by one, and obtains used tool ID56 corresponding to each WBS unit-process ID55. Then, the access-method table 22 is searched with the following conditions 6 and the conditions 7, and the method 31 used by data conversion is obtained. "Partner tool ID95" ( drawing 4 ) of the access-method table 22 is [ conditions / aforementioned / 6 ] in agreement with what was obtained from the product data table 17 in that "self-tool ID94" ( drawing 4 ) of the access-method table 22 is the parts library management function 96, and the aforementioned conditions 7.

[0095] If the product library management function 96 obtains a method 31, it will read data file 90a which is different in the CAD data file 90, will extract parts ID and other various data from the data of a text format, will use the concerned parts ID and the concerned used tool ID as a key, and will carry out additional registration in the parts library table 49.

[0096] Drawing 8 shows the relation of the above-mentioned process control table of the above-mentioned product data integration management database, and the above-mentioned product process procedure master table to the man day statistical information capture function in drawing, an evaluation statistical information

capture function, a statistical-analysis function, a man day estimation function, an entry receptionist function and the above-mentioned access-method table of the above-mentioned product data integration management database, a statistical-data table, and a statistics master table.

[0097] The man day estimation function 74 presumes the man day of the product registered by the entry receptionist function 1 from the product data table 17 in the manufacture data integration management database 14, the process control table 15, the statistical-data table 50, the statistics master table 51, the method 31, and the log file 20.

[0098] The man day statistical information capture function 71 is a function to collect the man day statistical information of the product developed in the past from the process control table 15 in the manufacture data integration management database 14, the statistical-data table 50, and the log file 20.

[0099] The evaluation statistical information capture function 72 is a function to collect the evaluation point informations on the product developed in the past from the product data table 17 in the manufacture data integration management database 14, the statistical-data table 50, the access-method table 22, and the method 31. The statistical-analysis function 73 is a function to analyze the statistical information of the product developed in the past, and to register the analysis result into the statistics master table 51 from the process control table 15 in the manufacture data integration management database 14, and the statistical-data table 50.

[0100] When a series of development work of the product 69 inputted by the entry receptionist function 1 is completed and it becomes mass-production start, the activate-request event 42 to the man day statistical information capture function 71 from a production control system 70 occurs. According to the demand event 42, the man day statistical information capture function 71 starts, and the following man day accumulating-totals processings are performed.

[0101] There, list reference of the instance 36 which is equivalent to WBS basic process which stands on the key as for the adopted flag registered into the process control table 15 in the product name of a product 69 is performed.

[0102] Then, the man day statistical information capture function 71 creates the instance 36 of the process control table 15, and the instance 76 of the statistical-data table 50 of this affair. The key items of the statistical-data table 50 are the name of a product 69, and the above-mentioned WBS unit-process ID. Moreover, as a data item of the statistical-data table 50, a process start time, a finish time, accumulation working hours, a work man day, the number of starts, a login name, and the evaluation point exist. Then, the man day statistical information capture function 71 searches an instance 76 for the name of a product 69 from the statistical-data table 50 one by one to a key.

[0103] The man day statistical information capture function 71 takes out two or more records 24 with the name of the same product 69 as the instance 76 which read the instance 76 from the record 24 of a log file 20 after one affair reading \*\*\*\*\*, and the above-mentioned WBS unit-process ID, and counts the number of cases. Then, the man day statistical information capture function 71 calculates the activation start time of the beginning of the tool used by the above-mentioned WBS unit-process ID which corresponds from this record 24, the maximum finish time and accumulation working hours, the number of starts, and a work man day. Then, the man day statistical information capture function 71 indicates the above-mentioned activation start time, the above-mentioned maximum finish time and the above-mentioned accumulation working hours, the above-mentioned number of starts, and the above-mentioned work man day to the read instance 76. The evaluation point item 78 is not set to the read instance 76.

[0104] When the man day statistical information capture function 71 performs processing about the above-mentioned WBS unit process which does not have tool support among the instances 76 of the statistical-data table 50, the following housekeeping performs. As the 1st procedure, the man day statistical information capture function 71 searches the name of a product 69 for ID of the tool support WBS unit process which gets mixed up in this WBS unit process without the above-mentioned tool support from the process control table 15 to a key. As the 2nd procedure, the man day statistical information capture function 71 searches the record 24 of a log file 20 for the name of the above-mentioned tool support WBS unit-process ID and the product 69 equivalent to the last process of this WBS unit process which were searched to a key, and deduces a finish time. As the 3rd procedure, the man day statistical information capture function 71 searches the record 24 of a log file 20 for the name of the above-mentioned tool support WBS unit-process ID and the product 69 equivalent to the back process of this WBS unit process which were searched to a key, and deduces a start time. As the 4th procedure, the man day statistical information capture function 71 calculates WBS unit-process working hours without the above-mentioned tool support, and deduces a man day from the difference of the above-mentioned last time and the above-mentioned start time.

[0105] the finish time of the log record 24 with which the man day statistical information capture function

71 is equivalent to the tool support WBS unit process of the process before the above-mentioned when two or more log records 24 in which the above-mentioned tool activation is described exist in the 2nd above-mentioned procedure -- checking -- this finish time -- large -- and -- the maximum -- the log record 24 of the same tool support WBS unit process with a finish time is searched. When it is able to search, the man day statistical information capture function 71 adopts the finish time of this log record 24.

[0106] When two or more log records 24 in which the above-mentioned tool activation is described exist in the 3rd above-mentioned procedure, the man day statistical information capture function 71 checks the start time of the log record 24 equivalent to the tool support WBS unit process of the process after the above-mentioned, and searches the log record 24 of the same tool support WBS unit process with a start time [ smaller / than this start time / and minimum ]. When it is able to search, the man day statistical information capture function 71 adopts the start time of this log record 24. Moreover, also with WBS unit process without the above-mentioned tool support, when the record 24 of a log file 20 is created in electronic mail and a manual input, the man day statistical information capture function 71 uses this log record 24, calculates the above-mentioned activation start time, the above-mentioned maximum finish time and the above-mentioned accumulation working hours, and the above-mentioned number of starts, and calculates a work man day.

[0107] The man day statistical information capture function 71 starts the evaluation statistical information capture function 72, just before ending the above-mentioned man day accumulating-totals processing. Within the data file 34 created or referred to, the CAD tool 4 used by the development phase of a product 69, the CAE tool 5, the CAM tool 6, the CAT tool 7, or the CAPP tool 8 takes out the parameter 77 which affects this tool warm-up time most, and uses the evaluation statistical information capture function 72 as the evaluation point 78.

[0108] The parameter 77 used as the evaluation point 78 and its calculation technique 79 are registered into the decided method 31 which exists in the method registration directory 75. The evaluation statistical information capture function 72 reads the name of a product 69 into a key for the statistical-data table 50 one by one. Then, the evaluation statistical information capture function 72 draws a method 31 from the method table 22. Then, the evaluation statistical information capture function 72 calls this method 31 that exists in the method registration directory 75. Then, the evaluation point 78 is calculated.

[0109] Then, the evaluation point 78 is returned to the evaluation statistical information capture function 72. Then, the evaluation statistical information capture function 72 reads the instance 76 of the statistical-data table 50 for the name of a product 69, and the above-mentioned WBS unit-process ID to a key, and indicates the evaluation point item 78. the instance 76 whose product 69 of the statistical-data table 50 corresponds work of the above [ the evaluation statistical information capture function 72 ] -- it carries out to all. When the method 31 which calculates the evaluation point 78 cannot be defined, the evaluation statistical information capture function 72 starts fixed value setting method 31a, and false evaluation point 78a is given.

[0110] The evaluation statistical information capture function 72 starts the statistical-analysis function 73, just before ending processing. This statistical-analysis function 73 receives activation, whenever the new data for a statistics are generated. To the process control table 15, this statistical-analysis function 73 adds projection data processing about a pattern name item, and acquires all the pattern modality informations 80. Then, this statistical-analysis function 73 carries out list reference of the instance 36 of the process control table 15 which is in agreement with the first pattern indicated by all the pattern modality informations 80, in order to ask for the relation between the evaluation point 78 and a man day every pattern modality informations 80 of all. Then, this statistical-analysis function 73 calculates the natural-logarithm value 82 of the sum man day computed by the natural-logarithm value 81 of the evaluation point 78 which asks a key for all the instances 76 from the statistical-data table 50, and was indicated by this instance 76, and calculation in the above-mentioned WBS basic-process ID indicated by the instance 36 by which list reference was carried out.

[0111] This statistical-analysis function 73 calculates the natural-logarithm value 82 of the sum man day computed by the natural-logarithm value 81 of the evaluation point 78, and the above-mentioned calculation from all the instances 76, and presumes the value of the proportionality coefficient  $K_{pi}$  of following the (1) formula, and the value of the exponent coefficient  $t_{pi}$  using a least squares method. Moreover, distributed value  $\sigma_{Npi}$  It asks.  $K_{pi}$  value,  $t_{pi}$  value, and distributed value  $\sigma_{Npi}$  By asking, the man day corresponding to the arbitrary evaluation point 78 can be presumed. the above -- this statistical-analysis function 73 -- every above-mentioned pattern -- the instance 36 of the process control table 15 -- all -- receiving -- moreover, all pattern modality informations a80 \*\*\*\* -- it processes to all patterns  $N_{hpi} = K_{pi} * (P_i)^{t_{pi}}$  .... For (1), however  $N_{hpi}$ , the presumed man day of WBS unit-process i under process

pattern  $p$  and  $K_{pi}$  are the proportionality coefficient of WBS unit-process  $i$  under process pattern  $p$ , and  $P_i$ . The evaluation point of WBS unit-process  $i$  under process pattern  $p$  and  $t_{pi}$  are the exponent coefficients of WBS unit-process  $i$  under process pattern  $p$ .

[0112] Then, it asks for all the instances 76 from the statistical-data table 50, and this statistical-analysis function 73 is (2), (3), and (4) below. A formula is calculated.

[0113]

$$H_{p,i,j} = N h_{j,p,i} / \sum_{i=1}^{N_p} (N h_{j,p,i}) \quad \dots\dots(2)$$

However,  $H_{pij}$  The rate of distribution and  $Nh_{pij}$  to all the man days of WBS unit-process  $i$  of process pattern  $p$  product  $j$  The actual condition all man day of WBS unit-process  $i$  of process pattern  $p$  product  $j$  and  $N_p$  are all WBS unit-process instances of process pattern  $p$ .

[0114]

$$\gamma_{p,i} = \frac{\sum_j H_{p,i,j}}{\sum_{i=1}^{N_p} \sum_j H_{p,i,j}} \quad \dots\dots(3)$$

[0115] However,  $\gamma_{p,i}$  is the rate of mean distribution of WBS unit-process  $i$  of process pattern  $p$ .

$$\sigma_{p,i}^2 = \{ \sum_j (\gamma_{p,i} - H_{p,i,j})^2 \} / j \quad \dots\dots(4)$$

Then, this statistical-analysis function 73 registers process pattern  $p$  and the above-mentioned WBS unit process into the key for the following data 85, 86, 87, and 88 in the statistics master table 51. Then, the statistical-analysis function 73 ends processing.

WBS unit process Proportionality coefficient of  $i$  (85) :  $K_{pi}$  WBS unit process Exponent coefficient of  $i$  (86) :  $t_{pi}$  WBS unit process Rate of mean distribution (87):  $\gamma_{p,i}$  variance value  $\sigma_{p,i}^2$  of  $i$ , and distributed value  $\sigma_{p,i}$  (88)

If the man day estimation function 74 is started, an operator 11 will perform the input of 69 products. Then, the instance 36 by which the man day estimation function 74 added the name of a product 69 to the key, and added unfinished [ "unfinished" ] or the "end" flag to STATUS flag from the process control table 15 is retrieved sequentially.

[0116] Among instances 36, about the aforementioned tool support WBS unit process, the product data table 17 is searched further and the process instance 18 is drawn as the man day estimation function 74 searches. Then, from the record 24 of the log file 20 corresponding to the name of the product 69 inputted as WBS unit-process ID with the process instance 18 read and applied, the man day estimation function 74 searches the start time and finish time of a tool, and calculates pre-forecast man day  $Nh_{bpi}$  of applicable WBS unit process. The result is written down in the temporary file 83.

[0117] When processing about the aforementioned WBS unit process which does not have tool support while the man day estimation function 74 searches an instance 36 one by one, it processes to the following housekeeping. As the 1st procedure, the man day estimation function 74 searches 69 products for the aforementioned tool support WBS unit-process ID which gets mixed up in this WBS unit process without tool support from the process control table 15 to a key. As the 2nd procedure, the man day estimation function 74 searches the record 24 of a log file 20 for the name of the aforementioned tool support WBS unit-process ID and the product 69 equivalent to the last process of this WBS unit process which were searched to a key, and deduces the last finish time. As the 3rd procedure, the man day estimation function 74 searches the record 24 of a log file 20 for the name of the aforementioned tool support WBS unit-process ID and the product 69 equivalent to the back process of this WBS unit process which were searched to a key, and deduces the first start time. as the 4th procedure, the man day estimation function 74 has no above-mentioned tool support from the difference of the aforementioned last time and a start time -- WBS unit-process working-hours guess is carried out, and pre-forecast man day  $Nh_{bpi}$  \*\* is calculated The result is written down in the temporary file 83. by the above technique, when the man day estimation function 74 starts, it has ended and begun -- WBS unit-process working-hours guess is carried out [ aforementioned ], and pre-forecast man day  $Nh_{bpi}$  \*\* is calculated Then, the man day estimation function 74 reads the method 31 which asks for the evaluation point 78 from the method directory 75, and calculates the evaluation point

78 from the data file 34 by which the point is carried out by the process instance 18. Then, from the statistics master table 51, the man day estimation function 74 searches the aforementioned process proportionality constant of the corresponding above-mentioned WBS unit process, and an exponent constant, and calculates forecast man day Nhapi after the above. The result is written down in the temporary file 84. then, the instance 36 by which, as for the man day estimation function 74, unfinished [ "unfinished" ] or the "end" flag added the name of a product 69 to STATUS flag obtained from the process control table 15 by the key - the above-mentioned processing is performed to all

[0118] The man day estimation function 74 performs after that a man day forecast of the aforementioned unsettled WBS unit process corresponding to the instance 36 which "it is unsettled" added to STATUS flag of the process control table 15. Then, pre-forecast man day Nhbpi the man day estimation function 74 is indicated to be by the temporary file 83, A comparison of post-forecast man day Nhapi indicated by the temporary file 84, And the parameter registered into the statistics master table 51, i.e., rate gammapi of mean distribution of WBS unit-process i, distributed value sigmaNpi, and distributed value sigmarpi Four parameters (5) which it pulls out and are the following, (6), (7), (8), and (9) A formula is calculated.

1) It is drawn from each man day of a theoretical worst value aforementioned WBS unit process being independent as follows.

$$\sum_{i=1}^n \max (N h a_{p i}, N h b_{p i}) + (N h b_{p k} / \gamma_{p k}) -$$

$$\sum_{i=1}^n (N h b_{p k} * \gamma_{p i} / \gamma_{p k}) +$$

$$\sum_{n+1}^{N p} \{ 1.96 \sigma_{r p i} * j^{-0.5} * (N h b_{p k} / \gamma_{p k}) \} \dots\dots(5)$$

however, k -- Nhbpk-Nhapk -- the processes id and n of Max -- an instance 36 -- "an end" or an "unfinished" flag -- being attached .

$$\sum_{i=1}^n \max (N h a_{p i}, N h b_{p i}) + (N h b_{p k} / \gamma_{p k}) -$$

$$\sum_{i=1}^n (N h b_{p k} * \gamma_{p i} / \gamma_{p k}) \dots\dots(6)$$

2) A theoretical usual upper limit

3) It is all WBS unit processes with which the "end" or the "unfinished" flag was attached to the instance 36, and the value of theoretical \*\*\*\*\* is (7) below. It is adapted when a formula is materialized.

[0119]

$$0 \leq |N h b_{p i} - N h a_{p i}| \leq 1.96 \sigma_{N p i} * j^{-0.5} \dots\dots(7)$$

[0120]

$$\sum_{i=1}^n N h b_{p i} + \{ \{ \sum_{i=1}^n (N h a_{p i} / \gamma_{p i}) \} / n \} * \{ \sum_{k=n+1}^{N p} \gamma_{p k} \} \dots\dots(8)$$

4) It is drawn from each man day of a theoretical best value aforementioned WBS unit process being independent as follows.

$$\sum_{i=1}^n N h b_{p i} + \{ \{ \sum_{i=1}^n (N h b_{p i} / \gamma_{p i}) \} / n \} *$$

$$\sum_{k=n+1}^{N p} \{ \gamma_{p k} - 1.96 \sigma_{r p k} * j^{-0.5} \} \dots\dots(9)$$

Then, the man day estimation function 74 displays the value drawn on I/O device 13 with the value of the above-mentioned (5), (6), (8), and (9) formula. Thereby, the forecast of a man day of an operator 11 is attained. Moreover, an operator 11 can guess the development cost of the development product 69 by the designs B/M91 which design B / M creation function 89 creates.

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[Translation done.]



## \* NOTICES \*

Japan Patent Office is not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

## DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the block diagram of one example of this invention.

[Drawing 2] It is the related view of the aforementioned entry receptionist function, a product data integration management database, a data control function, and the tool motion-control manager ability to a method in the entry receptionist function of this invention, a product data integration management database, a data control function, and the one example of a method.

[Drawing 3] They are a process control table, a product process procedure master table, a product data table, a distribution address table, a parts library table, the access-method table that the product data integration database constituted including a log file holds, a distribution management table, a statistical-data table, a statistics master table, the aforementioned process control table and a product process procedure master table, a product data table, a distribution address table, a parts library table, and the definition view of a log file.

[Drawing 4] It is a related view with design B / M creation function to the access-method table of the product data integration database which is this invention and the aforementioned process control table of the aforementioned product data integration database, and a product data table.

[Drawing 5] It is the related view of the product data table of the product data integration database to the concerned data distribution FM, a distribution address table, and a distribution management table in the one example of a data distribution FM among this inventions.

[Drawing 6] It is one example of a development schedule status-control function among this inventions, and is the related view of the tool motion-control manager ability to the concerned development schedule status-control function, the process control table of a product data integration database, and a product process procedure master table.

[Drawing 7] It is the related view of the parts library management function in the aforementioned development management framework to the access-method table and method of a product data integration database which are this invention.

[Drawing 8] The man day statistical information capture function among this inventions, and an evaluation statistical information capture function, In and the one example of a statistical-analysis function, a man day estimation function, an entry receptionist function, the access-method table of a product data integration database, a statistical-data table, and a statistics master table Receive the aforementioned man day statistical information capture function which is this invention, an evaluation statistical information capture function, a statistical-analysis function, a man day estimation function, an entry receptionist function, the aforementioned access-method table of a product data integration database, the aforementioned statistical-data table, and a statistics master table. It is the related view of the process control table of the aforementioned product data integration database, and a product process procedure master table.

[Drawing 9] It is \*\*\*\* about one example of the version-control method indicated by the key file among this inventions.

[Drawing 10] It is the block diagram of the conventional example.

[Description of Notations]

- 1 Entry Receptionist Function
- 2 Data Control Function
- 3 Tool Motion-Control Manager Ability
- 4 CAD Tool
- 5 CAE Tool
- 6 CAM Tool
- 7 CAT Tool,

- 8 CAPP Tool
- 9 EDA Framework
- 10 Task
- 11 Operator
- 12 Memory
- 13 I/O Device
- 14 Product Data Integration Management Database
- 15 Process Control Table
- 16 Product Process Procedure Master Table
- 17 Product Data Table
- 18 Process Instance
- 19 Key File
- 20 Log File
- 21 Instance
- 22 Access-Method Table
- 23 Method
- 24 Log Record
- 25, 25a Data file
- 26 Store Machine / Origin Directory
- 28 Store Machine / Origin Directory
- 29 Abandonment Event
- 30 Input End Event
- 31 Method
- 31a Fixed value method
- 32 Method Registration Directory
- 33 Data
- 34 Data File
- 35 Activate Request
- 36 Instance
- 37 Product Name Value
- 38 Version, the Access Technique Specification
- 39 Identifier Data
- 40 Activation Event
- 41 Method Call
- 42 Activation Event
- 43 Directory Information
- 44 Method Information
- 45 Instance
- 47 Distribution Address Table
- 48 Distribution Management Table
- 49 Parts Library Table
- 50 Statistical-Data Table
- 51 Statistics Master Table
- 52 Data Distribution FM
- 53 Other Systems
- 54 Product Name ID
- 55 WBS Unit-Process ID
- 56 Used Tool ID
- 57 Package Machine ID
- 58 Origin Directory
- 59 Transfer File
- 60 Data File
- 61 System Name
- 62 TCP/IP Address
- 63 The Number of Versions
- 64 Date
- 65 Status

- 66 Development Schedule Status-Control Function
- 67 Example of Screen Display
- 68 Completing Date
- 69 Product
- 70 Production Control System
- 71 Man Day Statistical Information Capture Function
- 72 Evaluation Statistical Information Capture Function
- 73 Statistical-Analysis Function
- 74 Man Day Estimation Function
- 75 Method Directory
- 76 Instance
- 77 Parameter
- 78 Evaluation Point
- 78a False evaluation point
- 79 The Calculation Technique
- 80 All Pattern Modality Informations
- 81 Natural-Logarithm Value of Evaluation Point
- 82 Natural-Logarithm Value of Sum Man Day
- 83 Temporary File
- 84 Temporary File
- 85 Proportionality Coefficient of WBS Unit Process
- 86 Exponent Coefficient of WBS Unit Process
- 87 Rate of Mean Distribution of WBS Unit Process
- 88 Distributed Value
- 89 Design B / M Creation Function
- 90 CAD Data File
- 90a CAD data file
- 91 Designs B/M
- 92 Partition Flag
- 93 Partition
- 94 Self-Tool ID
- 95 Partner Tool ID
- 96 Parts Library Management Function
- 97 Development Management Framework

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[Translation done.]

## \* NOTICES \*

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1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

## DRAWINGS

## [Drawing 9]

\*\*\*.ver1 — \*\*\*.ver2 — \*\*\*.ver3  
                   \*\*\*.ver4

ファイルの親子関係

###.ver5:\*\*\*.ver1 (他ツールからの変換で1版作成)

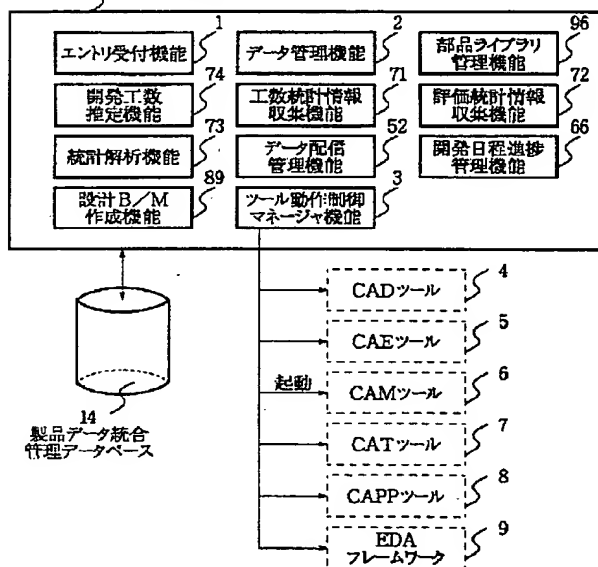
\*\*\*.ver1:\*\*\*.ver2;\*\*\*.ver3

\*\*\*.ver2:\*\*\*.ver4

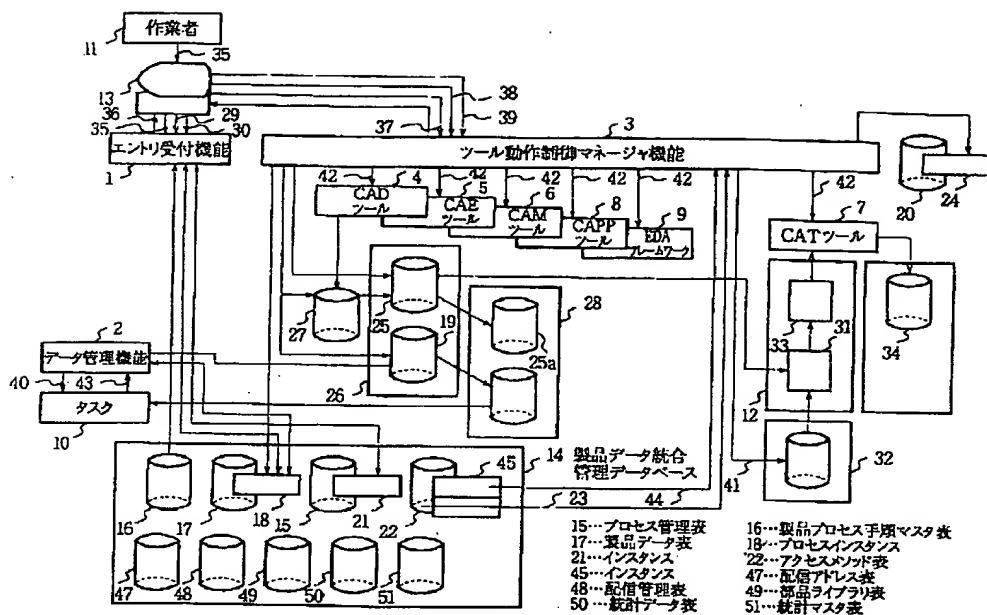
上記親子関係の表現方法

## [Drawing 1]

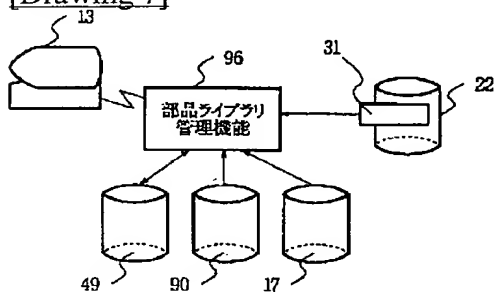
97 開発管理フレームワーク



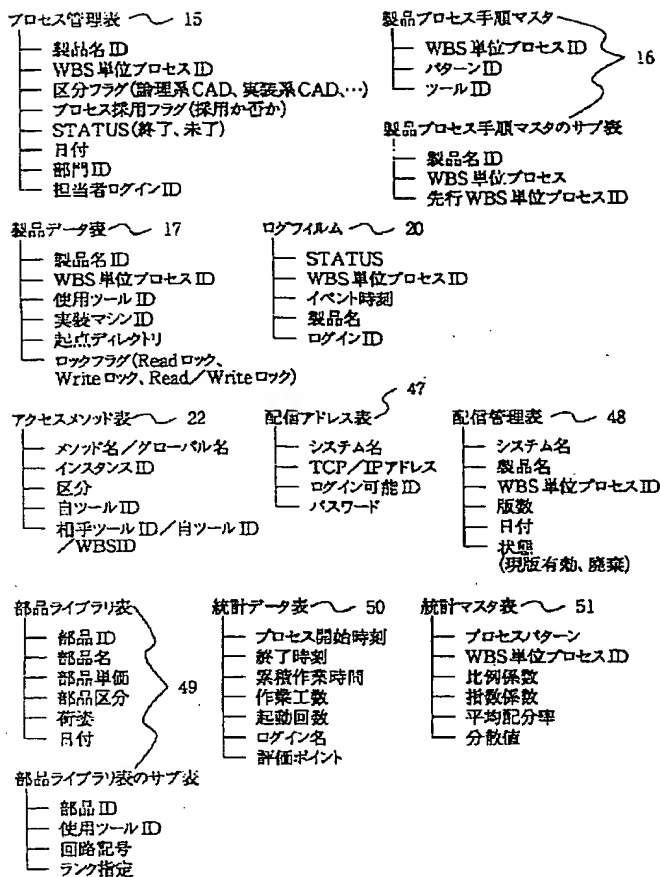
## [Drawing 2]



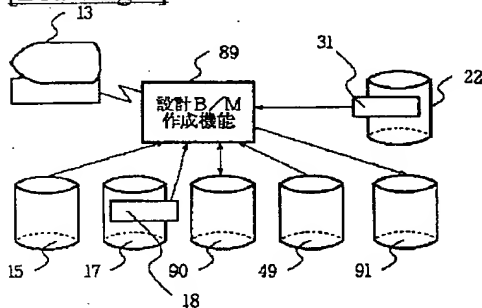
[Drawing 7]



[Drawing 3]



[Drawing 4]



プロセス管理表

製品名 ID	WBS 単位プロセス ID	区分フラグ	...
PC-98	PWB001	5	...
PC-98	LGC001	1	...

区分フラグ 1: 回路設計 ... 5: PWB 設計 ...

製品データ表

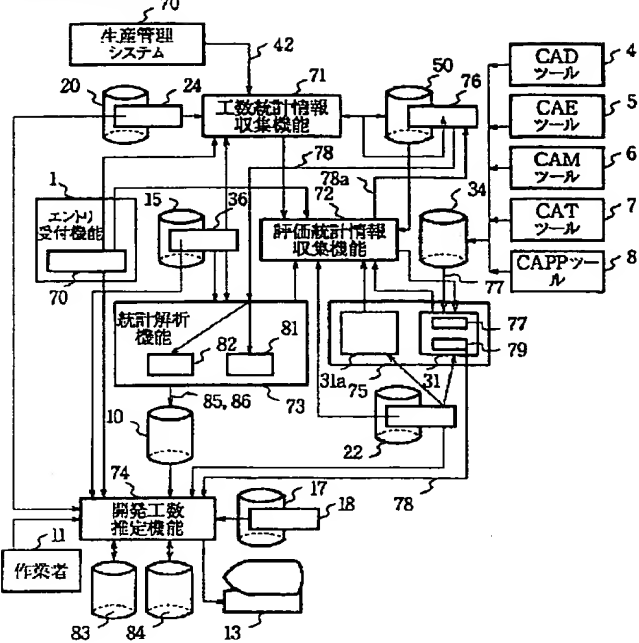
製品名 ID	WBS 単位プロセス ID	使用ツール ID	実装マシン ID	起点ディレクトリ
PC-98	PWB001	CR3000-1	131. 93. 200	/C3000/PWB
PC-98	LGC001	CR3000-1	131. 93. 200	/C3000/LGC

アクセスノート表

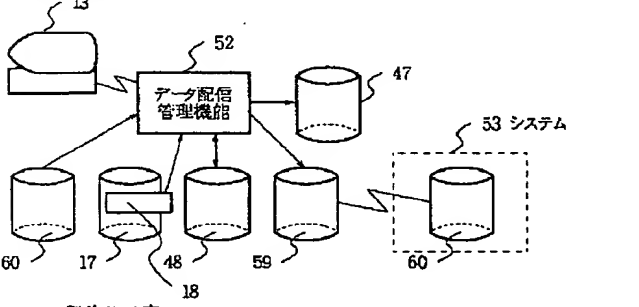
メソッド名	...	区分	自ツール ID	相手ツール ID	...
MPWB0001	...	5	MAKEB/M	CR3000-1	...
MLGC0001	...	1	CR3000-1	VISULA-1	...

区分 1: 回路設計 ... 5: PWB 設計 ...

[Drawing 8]



[Drawing 5]



製品データ表

製品名ID	WBS単位プロセスID	使用ツールID	実装マシンID	起点ディレクトリ
PC-98	PWB001	CR3000-1	131. 93. 200	/C3000/PWB
PC-98	LGC001	CR3000-1	131. 93. 200	/C3000/LGC

47 配信アドレス表

システム名	TCP/IPアドレス	...
MKIホスト	XXXXXXXXXXXX	...
PATSYS	YYYYYYYYYYYY	...

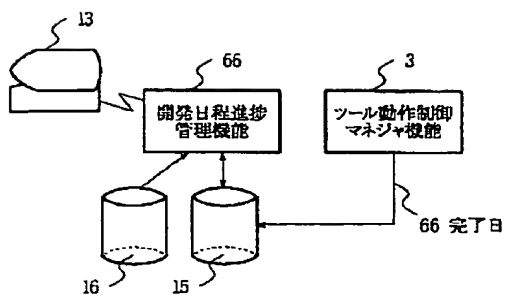
配信管理表

システム名	製品名ID	WBS単位プロセスID	版数	日付	状態
MKIホスト	PC-98	PWB001	001	931030	<u>1</u>
PATSYS	PC-98	LGC001	002	931030	<u>1</u>

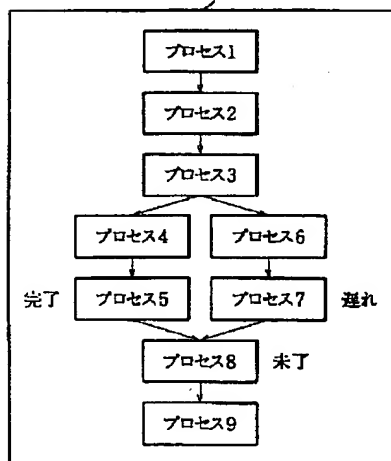
状態 1: 有効 2: 廃棄

[Drawing 6]

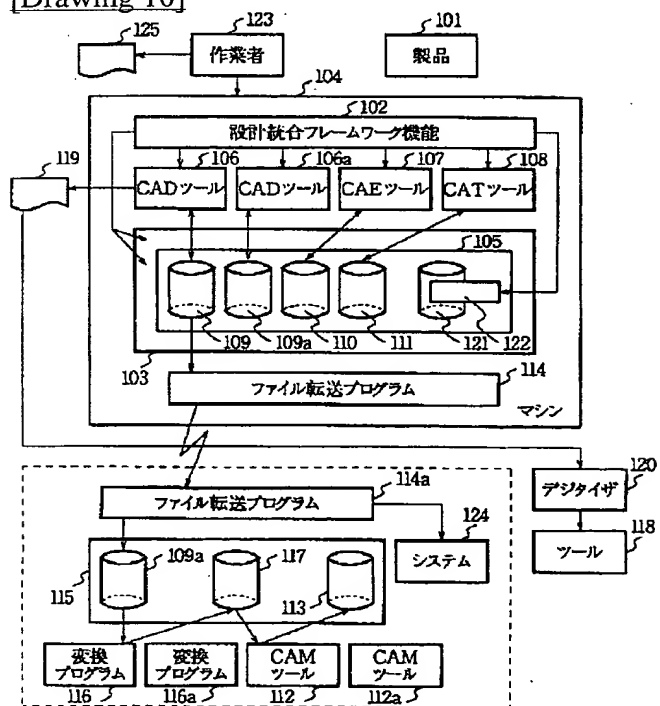




67 画面表示例



[Drawing 10]



[Translation done.]

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(71)出願人 000004237

日本電気株式会社

東京都港区芝五丁目7番1号

(72) 発明者 菊地 伸治

東京都港区

式会社内

松島 裕彦

東京都港区

式会社内

我理十 育

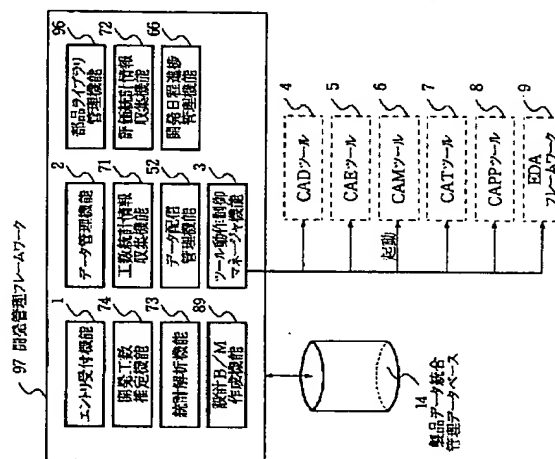
(74)代理人 弁理士 京本 直樹 (外2名)

(54) 【発明の名称】 製品データ統合管理データベースおよび開発管理フレームワーク

(57) 【要約】

【目的】製品の開発プロセスで発生する様々な形式の設計データ、および製造データを統合的に管理する。また、開発プロセスの進捗管理、および開発工数の予測を行う。

【構成】 エントリ受付機能 1 により、開発エントリを受けると、製品データ統合管理データベース 1 4 に、製品名と進捗管理するためのデータが登録される。その後、ツール動作制御マネージャ機能 3 により各種ツールを起動し、開発作業を進める。開発作業が終了すると、製品データ統合管理データベース 1 4 には、設計データ、製造データの所在が登録され、進捗状況もデータ登録される。製品名をキーにデータベースを検索すれば、開発プロセスの進捗状況を出力できる。開発工数推定機能 7 4 を起動すれば、過去に開発した製品に関する各種データを基に、開発途上もしくは開発予定の製品の開発工数を予測することができる。



【特許請求の範囲】

【請求項1】 任意の製品を開発、および製造する際  
の全業務を最小単位に分解し、該業務を体系化し、同一認  
識番号を付加し、製品名と前述同一認識番号とで従属情  
報を管理するプロセス管理表と、  
該プロセス管理表を作成する際の元データを含む製品プ  
ロセス手順マスタ表と、  
前記プロセス管理表のうち、CAD (Computer Aided  
Design) ツール、CAM (Computer Aided Man  
ufacturing) ツール、CAT (Computer Aided Test  
ing) ツール、CAE (Computer Aided Engineerin  
g) ツール、およびCAPP (Computer Aided Proc  
ess Planning) ツールのツール支援を受ける工程を  
抜き出し、前記製品名と前記同一認識番号とで従属情報  
を管理し、前記CADツール、前記CAMツール、前記  
CATツール、前記CAEツール、前記CAPPツール  
が作成するデータの格納先を指定する製品データ表と、  
前記CADツール、前記CAMツール、前記CATツ  
ール、前記CAEツール、前記CAPPツールの各ツール  
が作成するデータを開発管理フレームワークの管理外の  
システムに配信する場合に参照し、システムのアドレス  
の従属情報を管理している配信アドレス表と、  
製品を開発する際に使用する部品を一元管理する部品ラ  
イブラリ表とを具備する製品データ統合管理データベー  
スにおいて、  
過去に設計した製品について、前記プロセス管理表に登  
録されたWBS (Work Breakdown Structure) 基本  
プロセスの開始時刻、終了時刻、累積作業時間、作業工  
数、そのプロセスの評価ポイントを管理する統計データ  
表と、  
過去に設計した製品より導出される統計情報パラメータ  
を記録する統計マスタ表と、  
該配信作業に関する管理事項を記録する配信管理表と、  
前記CADツール、前記CAMツール、前記CATツ  
ール、前記CAEツール、前記CAPPツールの任意ツ  
ールが作成するデータを、別の任意ツールが読み込む場  
合に、該ツールに適合する形式にデータを自動変換するメ  
ソッドを管理するアクセスメソッド表とを具備すること  
を特徴とする製品データ統合管理データベース。  
【請求項2】 任意の製品を開発、および製造する際  
の全業務を最小単位に分解し、該業務を体系化し、同一認  
識番号を付加し、製品名と前述同一認識番号とで従属情  
報を管理するプロセス管理表と、該プロセス管理表を作  
成する際の元データを含む製品プロセス手順マスタ表  
と、前記プロセス管理表のうち、CAD) ツール、CA  
Mツール、CATツール、CAEツール、およびCAP  
Pツールのツール支援を受ける工程を抜き出し、前記製  
品名と前記同一認識番号とで従属情報を管理し、前記C  
ADツール、前記CAMツール、前記CATツール、前  
記CAEツール、前記CAPPツールが作成するデータ

の格納先を指定する製品データ表と、前記CADツ  
ール、前記CAMツール、前記CATツール、前記CAE  
ツール、前記CAPPツールの各ツールが作成するデー  
タを開発管理フレームワークの管理外のシステムに配信  
する場合に参照し、システムのアドレスの従属情報を管  
理している配信アドレス表と、製品を開発する際に使用  
する部品を一元管理する部品ライブラリ表とを具備する  
製品データ統合管理データベースであって、過去に設計  
した製品について、前記プロセス管理表に登録されたW  
BS基本プロセスの開始時刻、終了時刻、累積作業時  
間、作業工数、そのプロセスの評価ポイントを管理する  
統計データ表と、過去に設計した製品より導出される統  
計情報パラメータを記録する統計マスタ表と、該配信作  
業に関する管理事項を記録する配信管理表と、前記CA  
Dツール、前記CAMツール、前記CATツール、前記  
CAEツール、前記CAPPツールの任意ツールが作成  
するデータを、別の任意ツールが読み込む場合に、該ツ  
ールに適合する形式にデータを自動変換するメソッドを  
管理するアクセスメソッド表とを具備する製品データ統  
合管理データベース内に存在するプロセス管理表に登  
録された前記CADツール、前記CAMツール、前記CA  
Tツール、前記CAEツール、前記CAPPツールのツ  
ールの起動、および運転停止の制御を行い、前記CAD  
ツール、前記CAMツール、前記CATツール、前記C  
AEツール、前記CAPPツールのツールの作成するデ  
ータを、前記製造データ統合管理データベース内の前記  
製品データ表に記載された領域に格納し、前記CADツ  
ール、前記CAMツール、前記CATツール、前記CA  
Eツール、前記CAPPツールのツールの動作記録を、  
ログファイルに記録するツール動作制御マネージャ機能  
と、  
前記CADツール、前記CAMツール、前記CATツ  
ール、前記CAEツール、前記CAPPツールの任意ツ  
ールが参照する前記部品ライブラリ表を管理する部品ラ  
イブラリ管理機能と、  
前記CADツールが作成するデータから、部品表を作成  
する設計B/M作成機能とを具備する開発管理フレーム  
ワークにおいて、  
定型的な業務として開発開始のイベントを受け、前記プ  
ロセス管理表に、最小単位に分解した業務内容を記す前  
記WBS基本プロセスのインスタンスを登録するエント  
リ受付機能と、  
前記製品データ表のデータメンテナンスを自動的に行う  
データ管理機能と、  
前記プロセス管理表と前記ログファイルから、前記エン  
トリ受付機能で登録された前記製品の、開発日程進捗を  
表示する開発日程進捗管理機能と、  
前記CADツール、前記CAMツール、前記CATツ  
ール、前記CAEツール、前記CAPPツールの任意ツ  
ールが作成する前記データを該当該状態に応じて、外部のシ

システムに転送するデータ配信管理機能と、  
前記CADツール、前記CAMツール、前記CATツール、前記CAEツール、前記CAPPツールの任意ツールが作成するデータを、別のツールが読み込む場合に、該ツールの持つデータ形式に適合する様に自動変換するメソッドと、  
前記製品データ表、前記プロセス管理表、前記統計データ表、前記統計マスタ表、前記アクセスメソッド、および前記ログファイルから、前記エントリ受付機能により登録された前記製品の開発工数を推定する開発工数推定機能と、  
前記プロセス管理表、前記統計データ表、および前記ログファイルから、過去に開発した製品の工数統計情報を収集する工数統計情報収集機能と、  
前記製品データ表、前記統計データ表、前記アクセスメソッド表、前記アクセスメソッドから、過去に開発した製品の評価ポイント情報を収集する評価統計情報収集機能と、  
前記プロセス管理表、前記統計データ表から、過去に開発した製品の統計情報を解析し、その解析結果を前記統計マスタ表に登録する統計解析機能とを具備することを特徴とする開発管理フレームワーク。

#### 【発明の詳細な説明】

##### 【0001】

【産業上の利用分野】本発明は、デジタル計算機で取り扱うデータ順序または内容を操作してデータを処理する方法に関し、特に、データベース、およびフレームワークに関するもので、製造業の内、部品組立を主体とする機器産業の技術部門、設計部門、生産技術部門、製造部門、管理部門で実施される業務に適用される製品データ統合管理データベースおよび開発管理フレームワークに関する。

##### 【0002】

【従来の技術】従来技術について図10に示す。任意の製品101を設計する場合、作業員123は設計統合フレームワーク機能102を起動する。設計統合フレームワーク機能102が立ち上がると、データ格納領域103を指定しなければならないので、作業員123は製品101のデータファイル109, 110, 111を格納するマシン104の名称と、ディレクトリ105の名称とを設計統合フレームワーク機能102に入力する。

【0003】設計統合フレームワーク機能102は、下位のCADツール106, 106a、CAEツール107、CATツール108の作成するデータファイル109, 109a, 110, 111の格納先を、入力されたディレクトリ105に設定する。その後、いくつか存在するCADツール106, 106aのうち、最初に使用するべきCADツール106を使用して製品101が設計される。その結果、CADツール106により作成されるデータファイル109は、入力されたディレクトリ105の配下に作成される。最初に使用するべきCAD

ツール106で設計が終了した後、別のCADツール106aで次工程の設計を行う場合、該CADツール106aで作成されるデータファイル109aもディレクトリ105に格納される。

【0004】CADツール106, 106aを使用して、一連の設計手続きを終了した後、設計統合フレームワーク機能102の配下にはないCAMツール112により、製造関連データファイル113を作成する場合は、ディレクトリ105配下に存在するデータファイル109をファイル転送プログラム114, 114aを介して、CAMツール112自身のディレクトリ115配下にコピーする。コピーの結果、コピーデータファイル109aが作成される。その後、作業員123は、当該コピーデータファイル109aを介して、CAMツール112の処理を行う。

【0005】CAMツール112の処理を行う際は、前処理としてデータファイル109aの形式を、当該CAMツール112固有の形式に変換するため、作業員123は変換プログラム116を起動する。該変換プログラム116の起動の結果、中間生成ファイル117が作成される。作業員123は、変換プログラム116で中間生成ファイル117を作成した後、当該CAMツール112を起動する。CAMツール112と異なる別のCAMツール112aで処理する場合は、変換プログラム116と異なる別の変換プログラム116aを用意し、CAMツール112aの該当する形式に変換しなければならない。

【0006】もし設計統合フレームワーク機能102配下のCADツール106で作成されるデータファイル109のバージョンが更新された場合は、作業員123は、変換プログラム116、中間生成ファイル117を使用して、再度、同じ手続きを行わなければならない。

【0007】またCAMツール112と異なるツール118では、データファイル109を使用することなく、CADツール106の結果を出力紙面119に印字後、デジタイザ120を使用して読み込む方法を採用しなければならない。

【0008】設計統合フレームワーク機能102は、配下のCADツール106, 106aの起動、停止の動作を制御する度にログファイル121にレコード122をアペンドしていく。当該ファイル121の内容から、CADツール106, 106aそれぞれの動作を確認することができる。しかしファイル121を、製品101の開発日程進捗管理データとして使用することはない。したがって、製品101の開発日程進捗管理をする場合は、設計統合フレームワーク機能102配下のCADツール106, 106aを使用する作業員123が、記入する自己申告帳票125を参照して対応することになる。また製品101の開発工数の管理、予測、および原価予測は、作業員123の自己申告帳票125で得たデータを元に手計算、もしくはEDP入力後の進捗管理システムで行うことになる。

【0009】設計統合フレームワーク機能102配下のC

ADツール106、106aが作成したデータファイル109、109aを、別のシステム124に配信する場合は、ファイル転送プログラム114、114aを使用する。その場合、データファイル109、109a、110、111そのものの状態を管理している訳ではないので、開発途上のデータでもファイル転送が可能となる。

【0010】以上説明した従来技術に最も近い公知の資料として、特開平4-336382号公報が挙げられる。

【0011】

【発明が解決しようとする課題】以上説明した従来技術には、次のような課題がある。

【0012】第1に、データファイル109、109a、110、111に含まれるデータを共有化することは、設計統合フレームワーク機能102配下のCADツール106、106a、CAEツール107、CATツール108のみでできているに過ぎず、CAMツール112、112aのデータファイル113を管理する方法が存在していないため、いちいち変換プログラム116、116aを使って作成し直さなければならず、またデータファイル113の所在が、簡単に変えられてしまうので、該データファイル113を紛失してしまうこともある。

【0013】第2に、従来の方法では、開発日程の進捗管理や開発工数の予測は、作業員123の作成する自己申告帳票125によって関連データを集め、それを基に手計算、もしくはEDP入力後の進捗管理システムで行っており、その様な方法では、タイムリーな開発進捗の把握、開発原価の予測ができず、原価低減故の設計変更が不可能となる。

【0014】第3に、従来の方法では、製品101に従属なデータ管理は、作業員123に依存しており、データファイル109、109a、110、111、113が実際にどこに存在するかは、管理されていない。

【0015】

【課題を解決するための手段】本発明は、任意の製品を開発、および製造する際の全業務を最小単位に分解し、該業務を体系化し、同一認識番号を付加し、製品名と前述同一認識番号とで従属情報を管理するプロセス管理表と、該プロセス管理表を作成する際の元データを含む製品プロセス手順マスタ表と、前記プロセス管理表のうち、CAD (Computer Aided Design) ツール、CAM (Computer Aided Manufacturing) ツール、CAT (Computer Aided Testing) ツール、CAE (Computer Aided Engineering) ツール、およびCAPP (Computer Aided Process Planning) ツールのツール支援を受ける工程を抜き出し、前記製品名と前記同一認識番号とで従属情報を管理し、前記CADツール、前記CAMツール、前記CATツール、前記CAEツール、前記CAPPツールが作成するデータの格納先を指定する製品データ表と、前記CADツール、前

記CAMツール、前記CATツール、前記CAEツール、前記CAPPツールの各ツールが作成するデータを開発管理フレームワークの管理外のシステムに配信する場合に参照し、システムのアドレスの従属情報を管理している配信アドレス表と、製品を開発する際に使用する部品を一元管理する部品ライブラリ表とを具備する製品データ統合管理データベースにおいて、過去に設計した製品について、前記プロセス管理表に登録されたWBS (Work Breakdown Structure) 基本プロセスの開始時刻、終了時刻、累積作業時間、作業工数、そのプロセスの評価ポイントを管理する統計データ表と、過去に設計した製品より導出される統計情報パラメータを記録する統計マスタ表と、該配信作業に関する管理事項を記録する配信管理表と、前記CADツール、前記CAMツール、前記CATツール、前記CAEツール、前記CAPPツールの任意ツールが作成するデータを、別の任意ツールが読み込む場合に、該ツールに適合する形式にデータを自動変換するメソッドを管理するアクセスメソッド表とを具備することを特徴とするものである。

【0016】本発明は、任意の製品を開発、および製造する際の全業務を最小単位に分解し、該業務を体系化し、同一認識番号を付加し、製品名と前述同一認識番号とで従属情報を管理するプロセス管理表と、該プロセス管理表を作成する際の元データを含む製品プロセス手順マスタ表と、前記プロセス管理表のうち、CAD) ツール、CAMツール、CATツール、CAEツール、およびCAPPツールのツール支援を受ける工程を抜き出し、前記製品名と前記同一認識番号とで従属情報を管理し、前記CADツール、前記CAMツール、前記CATツール、前記CAEツール、前記CAPPツールが作成するデータの格納先を指定する製品データ表と、前記CADツール、前記CAMツール、前記CATツール、前記CAEツール、前記CAPPツールの各ツールが作成するデータを開発管理フレームワークの管理外のシステムに配信する場合に参照し、システムのアドレスの従属情報を管理している配信アドレス表と、製品を開発する際に使用する部品を一元管理する部品ライブラリ表とを具備する製品データ統合管理データベースであって、過去に設計した製品について、前記プロセス管理表に登録されたWBS基本プロセスの開始時刻、終了時刻、累積作業時間、作業工数、そのプロセスの評価ポイントを管理する統計データ表と、過去に設計した製品より導出される統計情報パラメータを記録する統計マスタ表と、該配信作業に関する管理事項を記録する配信管理表と、前記CADツール、前記CAMツール、前記CATツール、前記CAEツール、前記CAPPツールの任意ツールが作成するデータを、別の任意ツールが読み込む場合に、該ツールに適合する形式にデータを自動変換するメソッドを管理するアクセスメソッド表とを具備する製品データ統合管理データベース内に存在するプロセス管理

表に登録された前記CADツール、前記CAMツール、前記CATツール、前記CAEツール、前記CAP Pツールのツールの起動、および運転停止の制御を行い、前記CADツール、前記CAMツール、前記CATツール、前記CAEツール、前記CAP Pツールのツールの作成するデータを、前記製造データ統合管理データベース内の前記製品データ表に記載された領域に格納し、前記CADツール、前記CAMツール、前記CATツール、前記CAEツール、前記CAP Pツールのツールの動作記録を、ログファイルに記録するツール動作制御マネージャ機能と、前記CADツール、前記CAMツール、前記CATツール、前記CAEツール、前記CAP Pツールの任意ツールが参照する前記部品ライブラリ表を管理する部品ライブラリ管理機能と、前記CADツールが作成するデータから、部品表を作成する設計B/M作成機能とを具備する開発管理フレームワークにおいて、定型的な業務として開発開始のイベントを受け、前記プロセス管理表に、最小単位に分解した業務内容を記す前記WBS基本プロセスのインスタンスに登録するエントリ受付機能と、前記製品データ表のデータメンテナンスを自動的に行うデータ管理機能と、前記プロセス管理表と前記ログファイルから、前記エントリ受付機能で登録された前記製品の、開発日程進捗を表示する開発日程進捗管理機能と、前記CADツール、前記CAMツール、前記CATツール、前記CAEツール、前記CAP Pツールの任意ツールが作成する前記データを該当状態に応じて、外部のシステムに転送するデータ配信管理機能と、前記CADツール、前記CAMツール、前記CATツール、前記CAEツール、前記CAP Pツールの任意ツールが作成するデータを、別のツールが読み込む場合に、該ツールの持つデータ形式に適合する様に自動変換するメソッドと、前記製品データ表、前記プロセス管理表、前記統計データ表、前記統計マスタ表、前記アクセスメソッド、および前記ログファイルから、前記エントリ受付機能により登録された前記製品の開発工数を推定する開発工数推定機能と、前記プロセス管理表、前記統計データ表、および前記ログファイルから、過去に開発した製品の工数統計情報を収集する工数統計情報収集機能と、前記製品データ表、前記統計データ表、前記アクセスメソッド表、前記アクセスメソッドから、過去に開発した製品の評価ポイント情報を収集する評価統計情報収集機能と、前記プロセス管理表、前記統計データ表から、過去に開発した製品の統計情報を解析し、その解析結果を前記統計マスタ表に登録する統計解析機能とを具備することを特徴とするものである。

【0017】

【実施例】次に、本発明について図面を参照して説明する。図1は本発明の一実施例を示す構成図である。

【0018】図2は、図1中のエントリ受付機能、および製品データ統合管理データベース、およびデータ管理

機能、およびメソッドに対するツール動作制御マネージャ機能の関連を示す。

【0019】図3は、図2中のプロセス管理表、製品プロセス手順マスタ表、製品データ表、配信アドレス表、部品ライブラリ表、ログファイルを含んで構成される製品データ統合管理データベースが保持するアクセスメソッド表、配信管理表、統計データ表、統計マスタ表と、前述プロセス管理表、前述製品プロセス手順マスタ表、前述製品データ表、前述配信アドレス表、前述部品ライブラリ表、前述ログファイルの詳細を示す。

【0020】図4は、図1中の前述製品データ統合管理データベースのアクセスメソッド表に対する設計B/M作成機能、および前述製品データ統合管理データベースの前述プロセス管理表、前述製品データ表との関連を示す。

【0021】図5は、図1中のデータ配信管理機能に対する前述製品データ統合管理データベースの製品データ表、および配信アドレス表、および配信管理表の関連を示す。

【0022】図6は、図1中の開発日程進捗管理機能に対する前述ツール動作制御マネージャ機能、および前述製品データ統合管理データベースの前述プロセス管理表、および前述製品プロセス手順マスタ表の関連を示す。

【0023】図7は、図1中の前述製品データ統合管理データベースのアクセスメソッド表とメソッドに対する、前述開発管理フレームワーク内の部品ライブラリ管理機能の関連を示す。

【0024】図8は、図1中の工数統計情報収集機能、および評価統計情報収集機能、および統計解析機能、および開発工数推定機能、およびエントリ受付機能、および前述製品データ統合管理データベースの前述アクセスメソッド表、および統計データ表、および統計マスタ表に対する、前述製品データ統合管理データベースの前述プロセス管理表と前述製品プロセス手順マスタ表の関連を示す。

【0025】図9には、バージョン管理方式における、親子関係の表現方法を示す。

【0026】次に、図2を参照して、前述エントリ受付機能、前述製品データ統合管理データベース、前述データ管理機能、前述メソッドと前述ツール動作制御マネージャ機能の関連を詳細に説明する。

【0027】ツール動作制御マネージャ機能3とは、CADツール4、CAEツール5、CAMツール6、CATツール7、CAP Pツール8のツールの動作制御、環境制御を行うもので、従来からEDA (Electric Design Automation) フレームワーク機能と呼ばれているものに対して、前述メソッド読み込みの機能を追加したものである。

【0028】エントリ受付機能1とは、新たに開発する

製品を登録し、該製品の開発プロセスを登録する機能である。

【0029】製品データ統合管理データベース14は、CADツール4、CAMツール6、CATツール7、CAEツール5、CAPPツール8の各ツールが作成するデータファイル25とそのアクセス方法を管理するもので、製品を開発し、製造する際の業務内容を記したもので、業務フロー管理表に相当し、従来から存在するプロセス管理表15と、プロセス管理表15の元データを提供する製品プロセス手順マスタ表16と、EDAフレームワーク内のファイル管理方式で見られる構造を持つ製品データ表17と、ネットワークアドレスとシステムの対応関係を管理しており、従来のオブジェクトディクショナリに相当する配信アドレス表47と、CADツールでは、従来から存在している部品ライブラリ表49を含み、CADツールでは、従来から存在しているログファイル20を含んでいるとともに、データのアクセス方法が規定されており、データ変換プログラムでもあるメソッドを管理する新規定義のアクセスメソッド表22と、外部のシステムへの配信を管理する新規定義の配信管理表48と、プロセス管理表15に登録されたWBS基本プロセスの開始時刻、終了時刻、累積作業時間、作業工数、そのプロセスの評価ポイントを管理する新規定義の統計データ表50と、過去に設計した製品より導出される統計情報パラメータを記録する新規定義の統計マスタ表51とを含んで構成される。

【0030】データ管理機能2とは、製品データ統合管理データベース14内の製品データ表17のデータメンテナンスを自動的に行うものである。

【0031】エントリ受付機能1は、入出力装置13を介して、起動要求35を受けると、起動要求35で指定された製品名の開発を準備するために、製品データ統合管理データベース14中のプロセス管理表15を検索し、エントリ受付機能1で入力された製品名を持つインスタンス21が存在しているか否かのチェックを行う。

【0032】インスタンス21が存在していない場合、エントリ受付機能1は、プロセス管理表15に、製品名とWBS単位プロセスを検索キーに、該当件だけインスタンス21を登録するため、作業員11の入力作業待ちとなる。

【0033】前述WBS単位プロセスとは、前述製品の開発作業を構成する作業単位のこと、作業員11の所属する組織における標準化活動により、明確に定義されているものである。通常、プロセス管理表15には、一製品当たり数百～数千の前述WBS単位プロセスが登録される。

【0034】該WBS単位プロセスは、製品プロセス手順マスタ表16に登録されている。エントリ受付機能1で、プロセス管理表15に、WBS単位プロセス該当件だけインスタンス21を登録する場合、作業員11は、

製品プロセス手順マスタ表16から一覧検索表示されている全インスタンス36を入出力装置13上で取捨選択する。

【0035】前述製品の開発過程で、任意WBS単位プロセスを実行しない場合は、作業員11は、入出力装置13上で廃棄イベント29を発生すればよい。

【0036】その後、作業員11が、入力終了イベント30を発生させると、プロセス管理表15に、前述製品名と前述WBS単位プロセスをキーに該当件だけインスタンス21が登録される。

【0037】特に廃棄イベント29の発生した前述任意WBS単位プロセスは、プロセス管理表15に登録する際、該当するインスタンス21のプロセス採用フラグに、未採用フラグがセットされる。上記の方法で作業員11は、容易にプロセス管理表15のインスタンス21を登録することができる。

【0038】エントリ受付機能1は、プロセス管理表15に前述製品と前述WBS単位プロセスに対応する数量のインスタンス21を登録すると、ツール支援を受けるWBS単位プロセスを抜き出し、前述製品データ統合管理データベース内の製品データ表17に、前述製品名と前述WBS単位プロセスをキーに該当件数のプロセスインスタンス18を纏めて登録する。

【0039】該プロセスインスタンス18には、CADツール4、CAEツール5、CAMツール6、CATツール7、CAPPツール8のツールが、前述製品に関連するデータファイル25を新規に生成する度に、該データファイル25の格納マシン、および起点ディレクトリ26や、状態が記入される。

【0040】作業員11が開発開始のためにCADツール4、CAEツール5、CAMツール6、CATツール7、CAPPツール8のツールを起動しようとする場合、前処理としてツール動作制御マネージャ機能3が立ち上がる。該ツール動作制御マネージャ機能3は、配下のCADツール4、CAEツール5、CAMツール6、CATツール7、CAPPツール8の各ツールの立ち上げ制御を行う。

【0041】該ツール動作制御マネージャ機能3は立ち上げ時に、作業員11にエントリ受付機能1で入力された前述製品名の入力要求を行う。

【0042】入出力装置13を介して、エントリ受付機能1で入力された製品名値37が入力されると、該ツール動作制御マネージャ機能3は、該製品名値37をキーに、製品データ表17のプロセスインスタンス18を検索し、入出力装置13に一覧表示する。作業員11は、前述一覧表示から、該当するプロセスインスタンス18を選び出す。

【0043】該プロセスインスタンス18の検索ができかつ、データファイル25の配置先である前述格納マシン、および起点ディレクトリ26が記載されている場



合、データファイル25が既に存在していることになる。その場合、作業者11は該ツール動作制御マネージャ機能3に対し、版、アクセス方法指定38の入力（更新置き換え、新版の何れかを指定）を行う。

【0044】該ツール動作制御マネージャ機能3が製品データ表17を検索した結果、プロセスインスタンス18は、存在しているが、データファイル25の配置先である前述格納マシン、および起点ディレクトリ26が記載されていない場合、未だ対応する前述WBS単位プロセスの作業を行っていないことになる。

【0045】その場合、作業者11は、入出力装置13を介して、CADツール4、CAEツール5、CAMツール6、CATツール7、CAPPツール8の各ツールの生成するデータの格納先であるデータファイル25の所属する格納マシン、および起点ディレクトリ26の名前データ39を、該ツール動作制御マネージャ機能3に対して入力する。

【0046】該ツール動作制御マネージャ機能3は、入力された格納マシンおよび起点ディレクトリ26を、選択されたプロセスインスタンス18に上書きする。

【0047】特にCADツール4を統合してEDAフレームワーク9としている場合は、該EDAフレームワーク9が一括管理するデータファイル25の該起点ディレクトリ26が記載される。

【0048】その後、データファイル25は、該格納マシン、および起点ディレクトリ26に、生成されることになるので、選択されたプロセスインスタンス18には、該ツール動作制御マネージャ機能3が、read&writeロックを掛け、他ツールから使用できないようにする。

【0049】その後、ツール動作制御マネージャ機能3は、エントリ受付機能1で入力された前述製品名を記したキーファイル19を前述格納マシン、および起点ディレクトリ26配下に作成する。

【0050】その後、該ツール動作制御マネージャ機能3は、作業者11により選択されたプロセスインスタンス18から、自身が管理している配下のCADツール4、CAEツール5、CAMツール6、CATツール7、CAPPツール8の何れかツールを起動するため、起動イベント42を発行する。

【0051】ツール動作制御マネージャ機能3は、配下のCADツール4、CAEツール5、CAMツール6、CATツール7、CAPPツール8のツールを立ち上げる度に、ログレコード24を生成し、決められたマシンのファイル20にアペンドする。

【0052】ファイル20には、ステータスID項目（開始、中断、終了）、ツールID項目、イベント時刻項目、製品名項目、ログイン名項目が書き込まれる。

【0053】ツール動作制御マネージャ機能3により起動されたCADツール4、CAEツール5、CAMツール6、CATツール7、CAPPツール8のツールによ

り作成されるデータファイル25は、前述格納マシン、および起点ディレクトリ26とは別のテンポラリファイル27に作成されていく。

【0054】但し、製品データ表17の該当するプロセスインスタンス18には前述read&writeロックを掛けられているので、ツール動作制御マネージャ機能3配下の起動状態にある前述ツールとは異なるCADツール4、CAEツール5、CAMツール6、CATツール7、CAPPツール8のツールからは、データファイル25を使用することはできない。

【0055】テンポラリファイル27が格納される領域は、キーファイル19に記されている。

【0056】ツール動作制御マネージャ機能3は、CADツール4、CAEツール5、CAMツール6、CATツール7、CAPPツール8での処理が終了すると、キーファイル19に記されているテンポラリファイル27の格納領域から、プロセスインスタンス18に記載された前述格納マシン、および起点ディレクトリ26に、CADツール4、CAEツール5、CAMツール6、CATツール7、CAPPツール8で作成されたデータファイル25を移動する。

【0057】該移動処置の際、ツール動作制御マネージャ機能3は、アクセスメソッド表22から、CADツール4、CAEツール5、CAMツール6、CATツール7、CAPPツール8が作成するデータファイル25の持つべき固有グローバル名23を得る。

【0058】その後、ツール動作制御マネージャ機能3は、データファイル25を、前述固有グローバル名（23）とバージョン拡張子で再命名する。

【0059】前述の通り、ツール動作制御マネージャ機能3を起動する際に、プロセスインスタンス18に、データファイル25を格納する前述格納マシン、および起点ディレクトリ26が記載されている場合、作業者11は、該ツール動作制御マネージャ機能3に対し、版指定、アクセス方法の入力を行う。該版指定、該アクセス方法に応じて、前述バージョン拡張子の値が決まる。

【0060】その後、ツール動作制御マネージャ機能3は、製品データ表17の該当するプロセスインスタンス18の前述read&writeロックを解放し、他ツールよりアクセス可能な状態にする。その後、キーファイル19に記載されているテンポラリファイル27のパス名を削除する。

【0061】データファイル25は、キーファイル19に、図9に記された様に前述バージョン拡張子まで含めた形式で記載される。該バージョン拡張子の最大のものが最新版であり、メソッド31を使用して参照される場合は、該最新版のものが対象となる。

【0062】ツール動作制御マネージャ機能3は、その後、ログレコード24を生成し、決められた前述マシンのファイル20にアペンドする。

【0063】一定間隔でデータ管理機能2が、製品データ統合管理データベースの実装されているマシン上で起動する。

【0064】データ管理機能2が起動すると、データ管理機能2は、製品データ表17を順次検索し、プロセスインスタンス18に記載された前述格納マシン、および起点ディレクトリ26のパス名を得る。

【0065】その後、データ管理機能2は、前述格納マシン、および起点ディレクトリ26から、キーファイル19の存在を確認する。

【0066】ディスク容量上の制約、製品終了により、CADツール4、CAEツール5、CAMツール6、CATツール7、CAPPツール8で作成されるデータファイル25が、前述格納マシン、および起点ディレクトリ26とは別の格納マシン、および起点ディレクトリ28に移動して、データファイル25aとなっている場合、データ管理機能2は、製品データ表17の該当プロセスインスタンス18をreadロックする。

【0067】その後、該データ管理機能2は、キーファイル19を探索するタスク10を起動する起動イベント40を発行する。

【0068】起動したタスク10が、キーファイル19の所属する前述格納マシン、および起点ディレクトリ28を発見した場合、タスク10は前述格納マシン、および起点ディレクトリ28の情報43を、データ管理機能2に引渡し、処理を終了する。

【0069】データ管理機能2は、該格納マシン、および起点ディレクトリ28のパス名を製品データ表17のプロセスインスタンス18に記載する。その後、前述readロックを解除する。

【0070】ここで作業員11が、CADツール4を起動した後、CATツール7で、CADツール4の作成したデータファイル25を参照する場合は、CATツール7を管理しているツール動作制御マネージャ機能3が、アクセスメソッド表22を検索する。

【0071】その後、ツール動作制御マネージャ機能3は、リンクしたいツールのツールID（CADツール4のID）と、自身の管理している配下のツールのツールID（該CATツール7のID）をキーにアクセスメソッド表22より、メソッド31を検索し、メソッド情報44を得る。メソッド31の該当インスタンス45が複数存在する場合は、アクセスメソッド表22に、更にインスタンスIDも指定して、メソッド31を特定する。

【0072】その後、ツール動作制御マネージャ機能3は、製品データ表17の前述ツール（該CADツール4）に対応するプロセスインスタンス18から、前述格納マシン、および起点ディレクトリ26を引き当てる。その後、ツール動作制御マネージャ機能3は、前述格納マシン、および起点ディレクトリ26を引数に、前述の引き当てたメソッド31のメソッドコール41を行う。

【0073】すると、メソッド登録ディレクトリ32より、前述引き当てられたメソッド31が、データファイル25の格納されたマシン上のメモリ12上に展開され、前述希望ツール（該CADツール4）の最新バージョンのデータファイル25に記載されているデータが、メソッド31で変換されて、CATツール7のデータ33となってメモリ12上に展開され、その後、ツール動作制御マネージャ機能3の起動しているマシンに転送される。

【0074】データ33を作成するために参照された、前述他ツール（ツール4）のデータファイル25に依存する部分は、新たに作成されるCATデータ33のデータファイル34には記載されない。作業上、該データ33が必要となった場合は、ツール動作制御マネージャ機能3が、その度に、メソッド31を介して、メモリ12上にデータ33を展開する。

【0075】ツール動作制御マネージャ機能3は、アクセスメソッド表22を読み込む直前に、前述リンク希望ツールのデータファイル25が格納されている相手マシン上のタスク数と、ツール動作制御マネージャ機能3の実装されているマシンをつなぐネットワークのトラフィック量を計測している。

【0076】ツール動作制御マネージャ機能3は、メソッド31を実行するに当たり、性能上問題があり、メソッド31を介して、データ33をメモリ12上に展開するのが遅い場合は、ツール動作制御マネージャ機能3の実装されているマシンのディスクとメモリに該当するデータファイル25をコピーし、メソッド31で変換してからデータ33を得る。

【0077】該データ33は、不揮発の状態にすることも可能である。しかし通常、該データ33は、ツール動作制御マネージャ機能3の終了時に削除される。

【0078】その際、製品データ表17のプロセスインスタンス18は、前述の様にread&writeロックが掛かる。

【0079】図4を参照すると、設計B/M作成機能89とは、PWB設計の結果を基に設計B/Mを出力するものである。即ち、前述設計B/Mを作成する際にはPWB設計が完了したCADデータファイルが必要となる。設計B/M作成機能89を起動すると、以下の処理手順にしたがって前述設計B/Mが作成される。設計B/M作成機能89は、まず、入出力装置13から入力された製品名ID54を基にプロセス管理表15（図3）から、PWB設計プロセスを表すWBS単位プロセスID55を得て、入出力装置13にWBS単位プロセス55の一覧を表示する。作業員11は該一覧から、設計B/M91の元データとなるCADデータファイル90を作成したWBS単位プロセスを選択する（WBS単位プロセスID55を決定）。

【0080】次に設計B/M作成機能89は、製品デー

タ表17に対し、次に示す条件を満足するプロセスインスタンス18を検索し、CADデータファイル90の所在(実装マシンID57、起点ディレクトリ58)と、そのCADデータファイル90作成時の使用ツールID56を得る。前記条件とは、製品データ表17の製品名ID54が、入出力装置13から入力されたものと一致し、かつ、製品データ表17のWBS単位プロセスID55がWBS単位プロセス一覧から選択したものと一致することである。更に、設計B/M作成機能89は、アクセスメソッド表22に対し、次の条件1～条件3をすべて満たすものを検索し、データ変換に使用すべきメソッド31を得る。前記条件1とは、アクセスメソッド表22の「区分93」がPWB設計を表すものであること、前記条件2とは、アクセスメソッド表22の「自ツールID94」が、設計B/M91の出力ツールであるものであること、前記条件3とは、アクセスメソッド表22の「使用ツールID95」が、製品データ表17から得たものと一致するものであることである。設計B/M作成機能89は、CADデータファイル90を読み込み、メソッド31を使用し、設計B/M91作成に必要な項目(部品ID、部品名、回路記号など)を抽出し、その後、その項目よりCADデータファイル90の部品IDをキーとして、部品ライブラリ表49を参照し、疑似部品の排除、あるいは部品属性(部品単価など)の追加を行い、設計B/M91を作成する。

【0081】図5を参照すると、データ配信管理機能52とは、ツール動作制御マネージャ機能3で動作制御を行われているCADツール4、CAEツール5、CAMツール6、CATツール7、CAPPツール8を使用して作成された製造データ60aを外部のシステム53へ転送するものである。該製造データ60aは最新でかつ有効なものでなければならない。データ配信管理機能52を起動すると、以下の処理手順にしたがって他システム53へ製造データ60aの配信が行われる。データ配信管理機能52は、まず、入出力装置13から入力された製品名ID54と、WBS単位プロセスID55を基に、製品データ表17からプロセスインスタンス18を検索し、有効な製造データ60aの所在(実装マシンID57、起点ディレクトリ58)を得て、転送ファイル59をデータ複写で作成する。データ配信管理機能52は、次に、入出力装置13から入力された転送先のシステム名61を基に、配信アドレス表47から該システムのTCP/IPアドレス62を得て、転送ファイル59を他のシステム53へ転送する(データファイル60となる)。

【0082】更に、データ配信管理機能52は、の製品名ID54、WBS単位プロセスID55、システム名61を基に配信管理表48から前回転送した製造データ60aの版数63を得て、版数63を1版上げて登録する。

【0083】また製造データ60aの廃棄は、以下の処理手順にしたがって行われる。データ配信管理機能52は、入出力装置13から入力された製品名ID54、WBS単位プロセスID55を基に、配信管理表48から製造データ60aを転送したシステム名61をすべて抽出する。次に、データ配信管理機能52は、システム名61を基に配信アドレス表47から該システムのTCP/IPアドレス62を得て、製造データ60aの廃棄を通知する。同時に、データ配信管理機能52は、システム名61に対する配信管理表48の状態65を、“廃棄”とし登録する。

【0084】図6を参照すると、開発日程進捗管理機能66とは、ツール動作制御マネージャ機能3で動作制御を行われているCADツール4、CAEツール5、CAMツール6、CATツール7、CAPPツール8を使用して行われる設計作業等の進捗状況を容易に把握できるものである。

【0085】開発日程進捗管理機能66が起動されると、入出力装置13から入力された製品名54(図4)を基に、プロセス管理表15から、前述WBS単位プロセスの一覧が表示される。作業員11は、一覧表示された前述各WBS単位プロセスに対する完了予定日を入力すると、この完了予定日が、製品名54、WBS単位プロセスID55(図4)を基に、プロセス管理表15に登録される。

【0086】設計作業が進行している場合には、WBS単位プロセス55の進捗状況一覧は、画面表示例67のように表示される。WBS単位プロセスID55の相互関係は、製品プロセス手順マスタ表16から容易に得られる。

【0087】ツール支援のあるWBS単位プロセスID55と、ツール支援のないWBS単位プロセスID55とは、プロセス管理表15へ進捗状況を表示するための「完了日」項目68を登録する方法が異なる。ツール支援のないWBS単位プロセスID55では、作業員11が入出力装置13で入力した「完了日」項目68が、プロセス管理表15に登録される。

【0088】それに対して、ツール支援のあるWBS単位プロセスID55では、以下の様になる。まずCADツール4による設計作業を終了する時に、作業員11自身が、設計作業を完了したのか、作業中断か、を選択し、入出力装置13に入力する。設計作業自体が完了した場合は、ツール動作制御マネージャ3が設計作業を完了した日を、プロセス管理表15の「完了日」項目68として自動的に登録する。それに対し作業を中断した場合は、該登録を行わない。

【0089】図7を参照すると、部品ライブラリ管理機能96とは、ツール動作制御マネージャ機能3で、動作制御を行なっているCADツール4、CAEツール5、CAMツール6、CATツール7、CAPPツール8

(図2参照)で使用するツール毎の部品情報を、統合的な部品情報(部品名、部品単価等)に変換し、部品ライブラリ表49で管理するためのものである。

【0090】作業員11が、製品ライブラリ管理機能96を起動すると、作業員11のログイン名によって、登録権が判定される。

【0091】当該登録権が存在する場合は、作業員11は、更に入出力装置13上に一覧表示されたWBS単位プロセスID55(図5)から、該当するプロセスIDを選択し、更に、該当する製品名値37(図2)を入力する。入力されたWBS単位プロセスID55が、ライブラリ化の可能なツールで処理される場合には、入出力装置13には、要求されたWBS基本プロセスID55の該当ツールの描画内容が表示されることになる。また、ツールで処理できない場合は、エラーが入出力装置13に戻されることになる。

【0092】作業員11が、そこで描画されている部品シンボルをマウスクリックすると、更に入出力装置13より部品ID、使用ツールID、荷姿の部品属性の入力要求を受ける。その後、作業員11が、入出力装置13に、該当値を入力する。

【0093】その後、製品ライブラリ管理機能96は、入出力装置13から入力された、製品名値37、およびWBS単位プロセスID55を基に、製品データ表17から使用ツールID56を得る。その後、アクセスメソッド表22を、次の条件4、条件5で検索し、データ変換で使用するメソッド31を得る。前記条件4とは、アクセスメソッド表22の「自ツールID94」(図4)が部品ライブラリ管理機能96であること、前記条件5とは、アクセスメソッド表22の「相手ツールID95」(図4)が製品データ表17から得たものと一致することである。製品ライブラリ管理機能96は、メソッド31を得ると、CADデータファイル90を読み込み、テキスト形式のデータから部品ID、部品名、回路記号を抽出し、当該部品ID、および当該使用ツールIDをキーとして部品ライブラリ表49に登録する。

【0094】CADデータファイル90から得られる項目以外に関しては、製品ライブラリ管理機能96は、更に次の処理を行う。製品ライブラリ管理機能96は、入出力装置13から入力された製品名値37を基に、製品データ表17を順次、読み込んで行き、各WBS単位プロセスID55に対応する使用ツールID56を得る。その後、アクセスメソッド表22を、次の条件6、条件7で検索し、データ変換で使用するメソッド31を得る。前記条件6とは、アクセスメソッド表22の「自ツールID94」(図4)が部品ライブラリ管理機能96であること、前記条件7とは、アクセスメソッド表22の「相手ツールID95」(図4)が製品データ表17から得たものと一致することである。

【0095】製品ライブラリ管理機能96は、メソッド

31を得ると、CADデータファイル90とは異なるデータファイル90aを読み込み、テキスト形式のデータから部品ID、他各種データを抽出し、当該部品ID、および当該使用ツールIDをキーとして部品ライブラリ表49に追加登録する。

【0096】図8は、図中の工数統計情報収集機能、評価統計情報収集機能、統計解析機能、開発工数推定機能、およびエントリ受付機能、ならびに前述製品データ統合管理データベースの前述アクセスメソッド表、統計データ表、統計マスタ表に対する、前述製品データ統合管理データベースの前述プロセス管理表と前述製品プロセス手順マスタ表の関連を示す。

【0097】開発工数推定機能74は、製造データ統合管理データベース14内の製品データ表17、プロセス管理表15、統計データ表50、統計マスタ表51、メソッド31、ログファイル20から、エントリ受付機能1により登録された製品の開発工数を推定するものである。

【0098】工数統計情報収集機能71は、製造データ統合管理データベース14内のプロセス管理表15、統計データ表50、ログファイル20から、過去に開発した製品の工数統計情報を収集する機能である。

【0099】評価統計情報収集機能72は、製造データ統合管理データベース14内の製品データ表17、統計データ表50、アクセスメソッド表22、メソッド31から、過去に開発した製品の評価ポイント情報を収集する機能である。統計解析機能73は、製造データ統合管理データベース14内のプロセス管理表15、統計データ表50から、過去に開発した製品の統計情報を解析し、その解析結果を統計マスタ表51に登録する機能である。

【0100】エントリ受付機能1で入力された製品69の一連の開発作業が終了し、量産開始になった時点で、生産管理システム70から、工数統計情報収集機能71への起動要求イベント42が発生する。要求イベント42に応じて、工数統計情報収集機能71が起動し、以下の工数累計処理を行う。

【0101】ここでは、製品69の製品名をキーに、プロセス管理表15に登録されている採用済みフラグの立っているWBS基本プロセスに相当するインスタンス36の一覧検索を行う。

【0102】その後、工数統計情報収集機能71は、プロセス管理表15のインスタンス36と同件の統計データ表50のインスタンス76を作成する。統計データ表50のキー項目は、製品69の名と前述WBS単位プロセスIDである。また、統計データ表50のデータ項目としては、プロセス開始時刻、終了時刻、累積作業時間、作業工数、起動回数、ログイン名、評価ポイントが存在する。その後、工数統計情報収集機能71は、統計データ表50から、製品69の名をキーにインスタンス

76の検索を順次行う。

【0103】工数統計情報収集機能71は、インスタンス76を1件読み込んだ後、ログファイル20のレコード24から、読み込んだインスタンス76と同じ製品69の名と前述WBS単位プロセスIDを持つ複数のレコード24を取り出し、件数をカウントする。その後、工数統計情報収集機能71は、該レコード24より該当する前述WBS単位プロセスIDで使用するツールの最初の起動開始時刻と最終時刻、および累積作業時間、起動回数、作業工数を計算する。その後、工数統計情報収集機能71は、読み込んだインスタンス76に、前述起動開始時刻と前述最終時刻、および前述累積作業時間、前述起動回数、前述作業工数を記載する。読み込んだインスタンス76には、評価ポイント項目78をセットしない。

【0104】工数統計情報収集機能71が、統計データ表50のインスタンス76の内、ツール支援のない前述WBS単位プロセスについての処理を行う場合は、以下の段取りで行う。第1手順として、工数統計情報収集機能71は、前述ツール支援のない該WBS単位プロセスに前後するツール支援WBS単位プロセスのIDを、プロセス管理表15より、製品69の名をキーに検索する。第2手順として、工数統計情報収集機能71は、該WBS単位プロセスの前工程に相当する、検索された前述ツール支援WBS単位プロセスIDと製品69の名をキーに、ログファイル20のレコード24を検索し、終了時刻を割り出す。第3手順として、工数統計情報収集機能71は、該WBS単位プロセスの後工程に相当する、検索された前述ツール支援WBS単位プロセスIDと製品69の名をキーに、ログファイル20のレコード24を検索し、開始時刻を割り出す。第4手順として、工数統計情報収集機能71は、前述最終時間、前述開始時間の差から、前述ツール支援のないWBS単位プロセス作業時間を計算し、工数を割り出す。

【0105】もし前述第2手順で、前述ツール起動を記すログレコード24が複数存在する場合は、工数統計情報収集機能71は、前述前工程のツール支援WBS単位プロセスに相当するログレコード24の終了時刻をチェックし、該終了時刻よりも大きくかつ最大の終了時刻を持つ、同じツール支援WBS単位プロセスのログレコード24を検索する。検索できた場合、工数統計情報収集機能71は、該ログレコード24の終了時刻を採用する。

【0106】もし、前述第3手順で、前述ツール起動を記すログレコード24が複数存在する場合は、工数統計情報収集機能71は、前述後工程のツール支援WBS単位プロセスに相当するログレコード24の開始時刻をチェックし、該開始時刻よりも小さくかつ最小の開始時刻を持つ、同じツール支援WBS単位プロセスのログレコード24を検索する。検索できた場合、工数統計情報収

集機能71は、該ログレコード24の開始時刻を採用する。また、前述ツール支援のないWBS単位プロセスでも、電子メール、マニュアル入力でログファイル20のレコード24を作成される場合は、工数統計情報収集機能71は、該ログレコード24を使用して、前述起動開始時刻と前述最終時刻、および前述累積作業時間、前述起動回数を計算し、作業工数を計算する。

【0107】工数統計情報収集機能71は、前述工数累計処理を終了する直前に評価統計情報収集機能72を起動する。評価統計情報収集機能72は製品69の開発フェーズで使用するCADツール4、もしくはCAEツール5、もしくはCAMツール6、もしくはCATツール7、もしくはCAPPツール8が、作成もしくは参照するデータファイル34内で、該ツール起動時間に最も影響を与えるパラメータ77を取り出して、評価ポイント78とする。

【0108】評価ポイント78にするパラメータ77とその算出方法79は、メソッド登録ディレクトリ75に存在する、決められたメソッド31に登録されている。評価統計情報収集機能72は、統計データ表50を製品69の名をキーに順次読み込む。その後、評価統計情報収集機能72は、メソッド表22より、メソッド31を引き当てる。その後、評価統計情報収集機能72は、メソッド登録ディレクトリ75に存在する、該メソッド31をコールする。すると評価ポイント78が計算される。

【0109】その後、評価ポイント78は、評価統計情報収集機能72に戻される。その後、評価統計情報収集機能72は、製品69の名と前述WBS単位プロセスIDをキーに、統計データ表50に記載する。評価統計情報収集機能72は、上記の作業を統計データ表50の製品69が一致するインスタンス76すべてに行う。評価ポイント78を計算するメソッド31を定義できない場合は、評価統計情報収集機能72は、固定値設定メソッド31aを起動し、疑似的な評価ポイント78aが与えられる。

【0110】評価統計情報収集機能72は、処理を終了する直前に、統計解析機能73を起動する。該統計解析機能73は、新たな統計対象データが生成される度に起動を受ける。該統計解析機能73は、プロセス管理表15に対し、パターン名項目についての射影演算処理を加え、全パターン種類情報80を得る。その後、該統計解析機能73は、全パターン種類情報80毎に評価ポイント78と開発工数の関係を求めるため、全パターン種類情報80に記載されている最初のパターンに一致する、プロセス管理表15のインスタンス36を一覧検索する。その後、該統計解析機能73は、一覧検索されたインスタンス36に記載された前述WBS基本プロセスIDをキーに統計データ表50から全インスタンス76を

求め、該インスタンス76に記載された評価ポイント78の自然対数値81と、計算で算出される合計工数の自然対数値82を計算する。

【0111】該統計解析機能73は、評価ポイント78の自然対数値81と前述の計算で算出される合計工数の自然対数値82を全インスタンス76に対して求め、最小自乗法を用いて下記(1)式の比例係数 $K_{pi}$ の値、指数係数 $t_{pi}$ の値を推定する。また、分散値 $\sigma_{Npi}$ も求める。 $K_{pi}$ 値、 $t_{pi}$ 値、分散値 $\sigma_{Npi}$ を求めることで、任意評価ポイント78に対応する工数が推定できる。上記を、該統計解析機能73は、前述パターン毎には、プロセス管理表15のインスタンス36すべてに対し、また、全パターン種類情報a80には、全パターンに対し処理する。

.....(1)  
 $Nh_{pi} = K_{pi} * (P_i)^{t_{pi}}$   
 ただし、 $Nh_{pi}$ はプロセスパターンp下のWBS単位プロセスiの推定工数、 $K_{pi}$ はプロセスパターンp下のWBS単位プロセスiの比例係数、 $P_i$ はプロセスパターンp下のWBS単位プロセスiの評価ポイント、 $t_{pi}$ はプロセスパターンp下のWBS単位プロセスiの指数係数である。

【0112】その後、該統計解析機能73は統計データ表50から、全インスタンス76を求め、以下(2)(3)(4)式を計算する。

【0113】

$$H_{pij} = Nh_{pij} / \sum_{j=1}^{j=1} (Nh_{pij})$$

ただし、 $H_{pij}$ はプロセスパターンp製品jのWBS単位プロセスiの全工数に対する配分率、 $Nh_{pij}$ はプロセスパターンp製品jのWBS単位プロセスiの実態全工数、 $Np$ はプロセスパターンpの全WBS単位プロセスインスタンスである。

【0114】

$$T_{pi} = \frac{\sum_j H_{pij}}{\sum_{i=1}^{Np} \sum_j H_{pij}} \quad \text{.....(3)}$$

$$\sigma_{pi}^2 = \{ \sum (T_{pi} - H_{pij})^2 \} / j$$

その後、該統計解析機能73は、以下のデータ85、86、87、88を、プロセスパターンpと前述WBS単位プロセスをキーに、統計マスタ表51に登録していく。その後、統計解析機能73は処理を終了する。  
 WBS単位プロセスiの比例係数(85) :  $K_{pi}$   
 WBS単位プロセスiの指数係数(86) :  $t_{pi}$   
 WBS単位プロセスiの平均配分率(87) :  $\gamma_{pi}$   
 分散値 $\sigma_{Npi}$ 、分散値 $\sigma_{xpi}$ (88)  
 開発工数推定機能74を立ち上げると作業員11は、製品69名の入力を行う。その後、開発工数推定機能74は、製品69の名をキーに、プロセス管理表15から、STATUSフラグに「未了」もしくは「終了」フラグを付加したインスタンス36を順次検索する。

【0116】開発工数推定機能74が検索を行うに従い、インスタンス36の内、前記ツール支援WBS単位プロセスについては、更に製品データ表17を検索し、プロセスインスタンス18を引き当てる。その後、開発工数推定機能74は、読み当てたプロセスインスタンス18を持つWBS単位プロセスIDと入力された製品69の名に合致するログファイル20のレコード24より、ツールの開始時刻と終了時刻を検索し、該当WBS

.....(2)  
 【0115】ただし、 $\gamma_{pi}$ はプロセスパターンpのWBS単位プロセスiの平均配分率である。

.....(4)

単位プロセスの前予測工数 $Nh_{bpi}$ を計算する。その結果は、テンポラリファイル83に記入していく。

【0117】開発工数推定機能74が順次、インスタンス36を検索する内、ツール支援のない前記WBS単位プロセスについて処理を行う場合、以下の段取りで処理を行う。第1手順として、開発工数推定機能74は、ツール支援のない該WBS単位プロセスに前後する前記ツール支援WBS単位プロセスIDを、製品69名をキーに、プロセス管理表15より検索する。第2手順として、開発工数推定機能74は、該WBS単位プロセスの前工程に相当する、検索された前記ツール支援WBS単位プロセスIDと製品69の名をキーに、ログファイル20のレコード24を検索し、最終の終了時刻を割り出す。第3手順として、開発工数推定機能74は、該WBS単位プロセスの後工程に相当する、検索された前記ツール支援WBS単位プロセスIDと製品69の名をキーに、ログファイル20のレコード24を検索し、最初の開始時刻を割り出す。第4手順として、開発工数推定機能74は、前記最終時刻、開始時刻の差から、前述のツール支援なしのWBS単位プロセス作業時間推測し、前予測工数 $Nh_{bpi}$ を計算する。その結果を、テンポラ

リファイル83に記入していく。以上の方法により、開発工数推定機能74が起動した時点で終了、仕掛っている前記WBS単位プロセス作業時間推測し、前予測工数 $Nhb_{pi}$ を計算する。その後、開発工数推定機能74は、メソッドディレクトリ75より、評価ポイント78を求めるメソッド31を読みだし、プロセスインスタンス18でポイントされているデータファイル34より評価ポイント78を計算する。その後、開発工数推定機能74は、統計マスタ表51から、該当する前述WBS単位プロセスの前記プロセス比例定数、指数定数を検索し、前記後予測工数 $Nha_{pi}$ を計算する。その結果は、テンポラリファイル84に記入していく。その後、開発工数推定機能74は、製品69の名をキーに、プロセス管理表15から得られたSTATUSフラグに「未了」もしくは「終了」フラグの付加したインスタンス36すべてに

対し、上記処理を施す。

【0118】開発工数推定機能74は、その後、プロセス管理表15のSTATUSフラグに「未処理」が付加したインスタンス36に対応する前記未処理WBS単位プロセスの工数予測を行う。そこで、開発工数推定機能74は、テンポラリファイル83に記載される前予測工数 $Nhb_{pi}$ と、テンポラリファイル84に記載される後予測工数 $Nha_{pi}$ の比較、および、統計マスタ表51に登録されているパラメータ、すなわち、WBS単位プロセス $i$ の平均配分率 $\gamma_{pi}$ 、分散値 $\sigma_{Npi}$ 、分散値 $\sigma_{rpi}$ を引出し、以下の4つのパラメータ(5)(6)(7)(8)(9)式を計算する。

1) 理論上の最悪値

前記WBS単位プロセスの各工数が独立であることから、以下の様に導出される。

$$\sum_{i=1}^n \text{Max} (Nha_{pi}, Nhb_{pi}) + (Nhb_{pk} / \gamma_{pk}) -$$

$$\sum_{i=1}^n (Nhb_{pk} * \gamma_{pi} / \gamma_{pk}) +$$

$$\sum_{i=1}^{np} \{ 1.96 \sigma_{rpi} * j^{-0.5} * (Nhb_{pk} / \gamma_{pk}) \} \dots\dots(5)$$

ただし、 $k$ は $Nhb_{pk} - Nha_{pk}$ がMaxのプロセス $i$   
d、 $n$ はインスタンス36に「終了」もしくは「未了」

フラグの付いたものである。

2) 理論上の通常の上限值

$$\sum_{i=1}^n \text{Max} (Nha_{pi}, Nhb_{pi}) + (Nhb_{pk} / \gamma_{pk}) -$$

$$\sum_{i=1}^n (Nhb_{pk} * \gamma_{pi} / \gamma_{pk}) \dots\dots(6)$$

3) 理論上の最適値

この値は、インスタンス36に「終了」もしくは「未了」フラグの付いたすべてのWBS単位プロセスで、以下(7)式が成立する場合に適応される。

【0119】

$$0 \leq |Nhb_{pi} - Nha_{pi}| \leq 1.96 \sigma_{Npi} * j^{-0.5} \dots\dots(7)$$

【0120】

4) 理論上の最良値

前記WBS単位プロセスの各工数が独立であることから、以下の様に導出される。

$$\sum_{i=1}^n Nhb_{pi} + \{ \{ \sum_{i=1}^n (Nha_{pi} / \gamma_{pi}) \} / n \} * \{ \sum_{i=1}^{k-n+1} \gamma_{pi} \} \dots\dots(8)$$

$$\sum_{i=1}^n Nhb_{pi} + \{ \{ \sum_{i=1}^n (Nhb_{pi} / \gamma_{pi}) \} / n \} *$$

$$\sum_{i=1}^{np} \{ \gamma_{pi} - 1.96 \sigma_{rpi} * j^{-0.5} \} \dots\dots(9)$$

その後、開発工数推定機能74は、上記の(5)(6)(8)(9)式の値により、導出される値を、入出力装置13に表示

する。それにより作業員11は、開発工数の予測が可能となる。また作業員11は、設計B/M作成機能89が



作成する設計B/M91とで開発製品69の開発原価が推測できることになる。

【0121】

【発明の効果】本発明によって奏される効果は次のとおりである。

【0122】第1に、本発明の製品データ統合管理データベースおよび開発管理フレームワークによれば、非定型的に発生する製品データを一元管理できるので、必要な時に必要な形式で得ることができる。そのため、図2のデータファイル25、25aの変換手続きが不要となり、その結果、データの信頼性が向上し、さらに、図2のデータファイル25、25aの所在を変更しても、図2のデータ管理機能2が、可能な限り自動メンテナンスを行うので、データの信頼性が向上する。

【0123】第2に、本発明の製品データ統合管理データベースおよび開発管理フレームワークによれば、図8に記される開発工数推定機能74が、タイムリーな開発進捗を提示するので開発原価の予測ができる。

【0124】第3に、本発明の製品データ統合管理データベースおよび開発管理フレームワークによれば、非定型的に発生する製品データを一元管理できるので、必要な時に必要な形式で得ることができ、そのため、図2のデータファイル25、25aの変換手続きが不要となり、その結果、データの信頼性が向上し、さらに、図2のデータファイル25、25aの所在を変更しても、図2のデータ管理機能2が、可能な限り自動メンテナンスを行うので、データの信頼性が向上する。

【0125】第4に、本発明によれば、組織、配置に関係なく開発業務の進捗把握、管理が可能となる。

【0126】第5に、本発明によれば、データの保持方法として、疎結合方式を採用しているので、データ保持については柔軟である。

【図面の簡単な説明】

【図1】本発明の一実施例の構成図である。

【図2】本発明のエントリ受付機能、および製品データ統合管理データベース、およびデータ管理機能、およびメソッドの一実施例で、前記エントリ受付機能、製品データ統合管理データベース、データ管理機能、メソッドに対するツール動作制御マネージャ機能の関連図である。

【図3】プロセス管理表、製品プロセス手順マスタ表、製品データ表、配信アドレス表、部品ライブラリ表、ログファイルを含んで構成される製品データ統合データベースが保持するアクセスメソッド表、配信管理表、統計データ表、統計マスタ表と、前記プロセス管理表、製品プロセス手順マスタ表、製品データ表、配信アドレス表、部品ライブラリ表、ログファイルの定義図である。

【図4】本発明である製品データ統合データベースのアクセスメソッド表に対する設計B/M作成機能、および前記製品データ統合データベースの前記プロセス管理

表、製品データ表との関連図である。

【図5】本発明のうち、データ配信管理機能の一実施例で、当該データ配信管理機能に対する製品データ統合データベースの製品データ表、および配信アドレス表、および配信管理表の関連図である。

【図6】本発明のうち、開発日程進捗管理機能の一実施例で、当該開発日程進捗管理機能に対するツール動作制御マネージャ機能、および製品データ統合データベースのプロセス管理表、および製品プロセス手順マスタ表の関連図である。

【図7】本発明である製品データ統合データベースのアクセスメソッド表とメソッドに対する、前記開発管理フレームワーク内の部品ライブラリ管理機能の関連図である。

【図8】本発明のうち、工数統計情報収集機能、および評価統計情報収集機能、および統計解析機能、および開発工数推定機能、およびエントリ受付機能、および製品データ統合データベースのアクセスメソッド表、および統計データ表、および統計マスタ表の一実施例で、本発明である前記工数統計情報収集機能、評価統計情報収集機能、統計解析機能、開発工数推定機能、エントリ受付機能、製品データ統合データベースの前記アクセスメソッド表、前記統計データ表、統計マスタ表に対する、前記製品データ統合データベースのプロセス管理表と製品プロセス手順マスタ表の関連図である。

【図9】本発明のうち、キーファイルに記載されるバージョン管理方式の一実施例を示鈴である。

【図10】従来例の構成図である。

【符号の説明】

- |    |                 |
|----|-----------------|
| 1  | エントリ受付機能        |
| 2  | データ管理機能         |
| 3  | ツール動作制御マネージャ機能  |
| 4  | CADツール          |
| 5  | CAEツール          |
| 6  | CAMツール          |
| 7  | CATツール、         |
| 8  | CAPPツール         |
| 9  | EDAフレームワーク      |
| 10 | タスク             |
| 11 | 作業者             |
| 12 | メモリ             |
| 13 | 入出力装置           |
| 14 | 製品データ統合管理データベース |
| 15 | プロセス管理表         |
| 16 | 製品プロセス手順マスタ表    |
| 17 | 製品データ表          |
| 18 | プロセスインスタンス      |
| 19 | キーファイル          |
| 20 | ログファイル          |
| 21 | インスタンス          |

2 2	アクセスメソッド表	6 2	TCP/IPアドレス
2 3	メソッド	6 3	版数
2 4	ログレコード	6 4	日付
2 5, 2 5 a	データファイル	6 5	状態
2 6	格納マシン/起点ディレクトリ	6 6	開発日程進捗管理機能
2 8	格納マシン/起点ディレクトリ	6 7	画面表示例
2 9	廃棄イベント	6 8	完了日
3 0	入力終了イベント	6 9	製品
3 1	メソッド	7 0	生産管理システム
3 1 a	固定値メソッド	7 1	工数統計情報収集機能
3 2	メソッド登録ディレクトリ	7 2	評価統計情報収集機能
3 3	データ	7 3	統計解析機能
3 4	データファイル	7 4	開発工数推定機能
3 5	起動要求	7 5	メソッドディレクトリ
3 6	インスタンス	7 6	インスタンス
3 7	製品名値	7 7	パラメータ
3 8	版, アクセス方法指定	7 8	評価ポイント
3 9	名前データ	7 8 a	疑似的评价ポイント
4 0	起動イベント	7 9	算出方法
4 1	メソッドコール	8 0	全パターン種類情報
4 2	起動イベント	8 1	評価ポイントの自然対数値
4 3	ディレクトリ情報	8 2	合計工数の自然対数値
4 4	メソッド情報	8 3	テンポラリファイル
4 5	インスタンス	8 4	テンポラリファイル
4 7	配信アドレス表	8 5	WBS単位プロセスの比例係数
4 8	配信管理表	8 6	WBS単位プロセスの指数係数
4 9	部品ライブラリ表	8 7	WBS単位プロセスの平均配分率
5 0	統計データ表	8 8	分散値
5 1	統計マスタ表	8 9	設計B/M作成機能
5 2	データ配信管理機能	9 0	CADデータファイル
5 3	他システム	9 0 a	CADデータファイル
5 4	製品名ID	9 1	設計B/M
5 5	WBS単位プロセスID	9 2	区分フラグ
5 6	使用ツールID	9 3	区分
5 7	実装マシンID	9 4	自ツールID
5 8	起点ディレクトリ	9 5	相手ツールID
5 9	転送ファイル	9 6	部品ライブラリ管理機能
6 0	データファイル	9 7	開発管理フレームワーク
6 1	システム名		

【図 9】

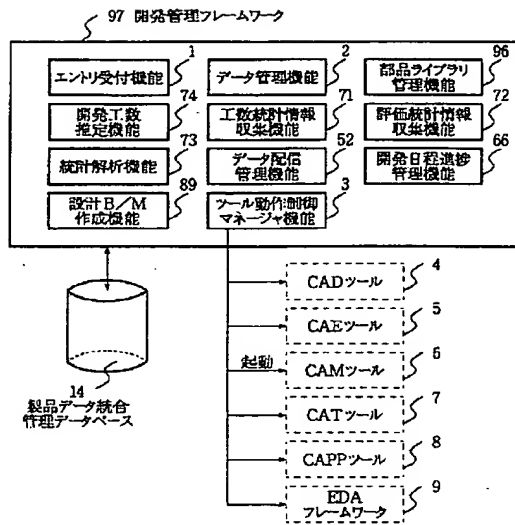
```

***.ver1 ——— ***.ver2 ——— ***.ver3
      |
      +——— ***.ver4
            ファイルの親子関係

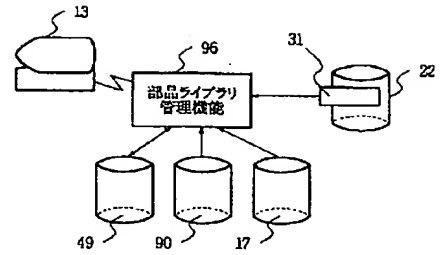
###.ver5: ***.ver1      (他ツールからの変換で1版作成)
***.ver1: ***.ver2: ***.ver3
***.ver2: ***.ver4
      上記親子関係の表現方法

```

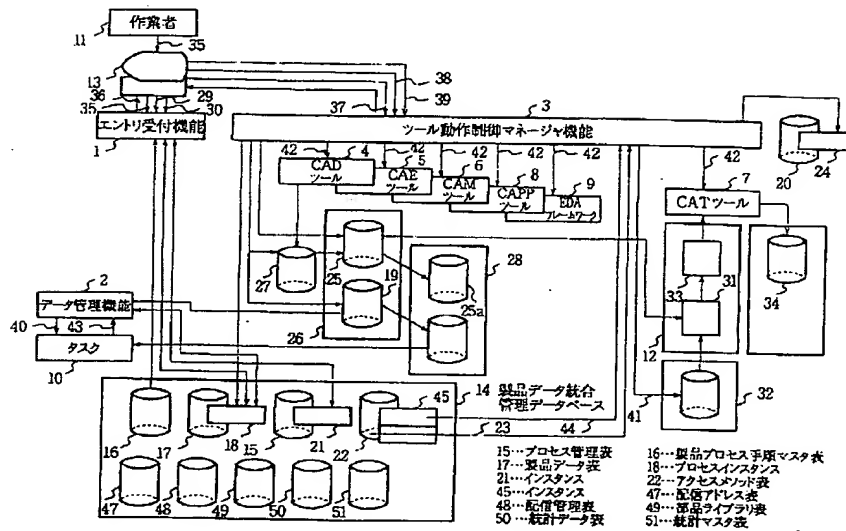
【図 1】



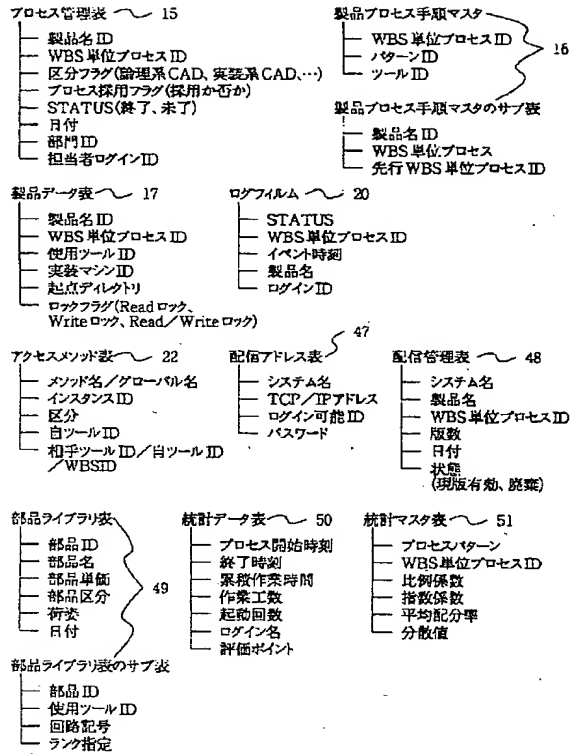
【図 7】



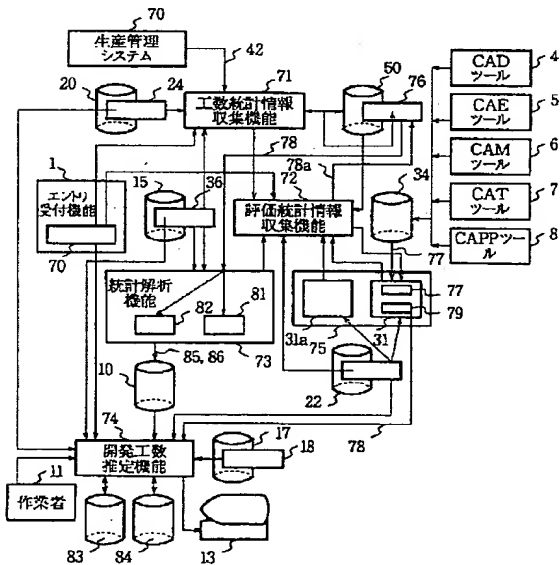
【図 2】



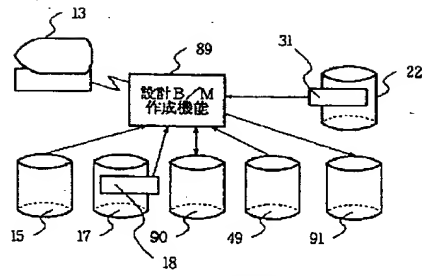
【図3】



【図8】



【図4】



プロセス管理表 15

製品名ID	WBS単位プロセスID	区分フラグ	...
PC-98	PWB001	5	...
PC-98	LGC001	1	...

区分フラグ 1: 回路設計 ... 5: PWB設計 ...

製品データ表 17

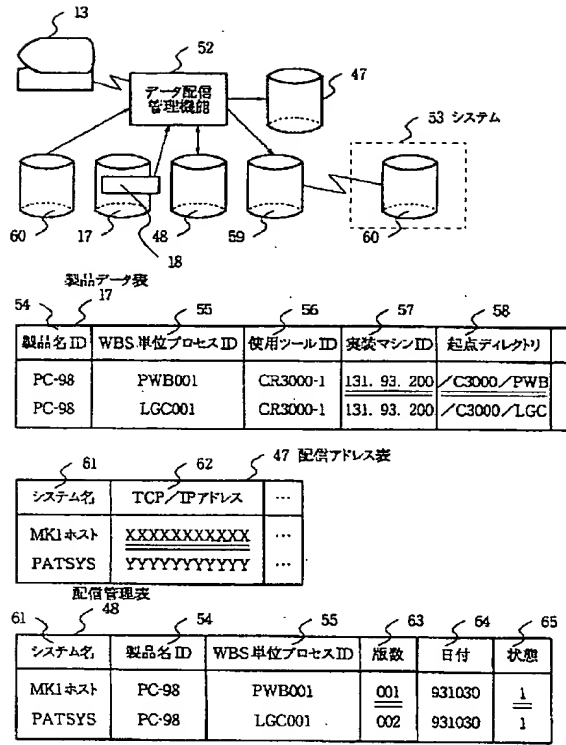
製品名ID	WBS単位プロセスID	使用ツールID	実装マシンID	起点ディレクトリ
PC-98	PWB001	CR3000-1	131. 93. 200	/C3000/PWB
PC-98	LGC001	CR3000-1	131. 93. 200	/C3000/LGC

アクセスメント表 22

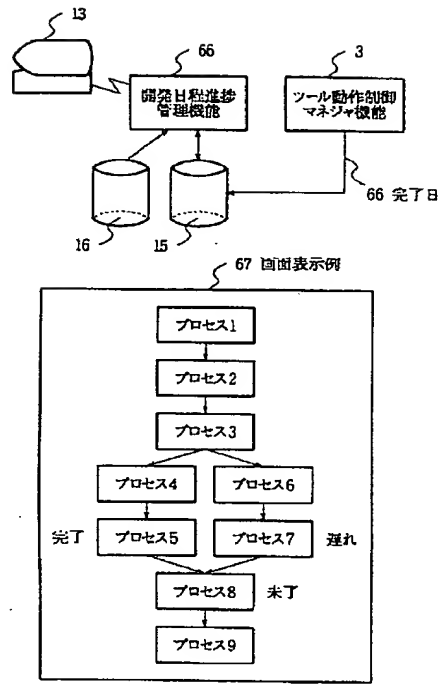
メソッド名	...	区分	自ツールID	相手ツールID	...
MPWB0001	...	5	MAKEB/M	CR3000-1	...
MLGC0001	...	1	CR3000-1	VISULA-1	...

区分 1: 回路設計 ... 5: PWB設計 ...

【図 5】



【図 6】



【図 10】

